

# [ Course Synopsis School of Food Science and Nutrition ]

Excellence Centre for Study, Training and  
Research of Food Science & Technology,  
Nutrition and Food Science

#### DEAN

**Assoc. Prof. Dr. Sharifudin Md. Shaarani**  
BSc (UKM), MSc (Reading), PhD. (Cambridge)

#### DEPUTY DEAN (*Academic & Student Affairs*)

**Dr. Mohd Rosni Sulaiman**  
BSc. (UKM), MSc. (UMS), Ph.D (UPM)

#### DEPUTY DEAN (*Research & Innovation*)

**Dr. Lee Jau Shya**  
BSc (UKM), Ph.D (USM)

#### SENIOR ASSISTANT REGISTRAR

**Muhaimin Hj. Abd. Sani**  
B. Soc. Sc. (Hons) (USM)

#### SCIENCE OFFICER

**Muhin Haji**  
BSc. (UPM)

#### BACHELOR OF FOOD SCIENCE WITH HONOURS

BPKP CODE	PROGRAMMES OFFERED
HS04	Food Science & Nutrition
HY07	Food Technology & Bioprocessing
HG09	Food Service

**For further inquiries, please contact :**

**Administrative Office at  
School of Food Science and Nutrition**

Tel	: 6088-320256
Fax	: 6088-320259
E-mail	: <a href="mailto:pejssmp@ums.edu.my">pejssmp@ums.edu.my</a>

## SCHOOL CORE

### NT10102 FUNDAMENTALS OF FOOD SCIENCE AND NUTRITION

This course discusses the need for foods, the sources and functions of nutrients in foods, global food issues, aesthetic quality and economy of foods. Students will be exposed to a few fundamental aspects of food science and technology, including food chemistry, food processing and preservation, food safety, food engineering and biotechnology. On top of this, this course also discusses food in the universal perspective including food and culture, its role in human nutrition, food availability and health inequalities. The nutrition component of this course includes the history and evolution of nutrition science, food habit, food choices and gives an overview of the effects of dietary intake on the human body in order to promote understanding of food for health. Besides, this course also aimed to deliver knowledge about the development, importance and influence of foods. It is also aimed to provide healthy food intake guidelines to the students.

#### References

- Brown, JE. 2002. Nutrition Now. US: Wadsworth.
- Butterworth Heineman. McWilliams, M. 1997. Foods: experimental perspectives. 3rd Edition. New Jersey: Prentice-Hall.
- Potter, N.N. & J.H. Hotchkiss. 1995. Food Science. 5th Edition. London: Chapman and Hall.
- Fellows, P.J. 1990. Food Processing Technology, Principles and Practice. London: Ellis Horwood Gamman
- Grosvenor, MB & Smolin LA. 2002. Nutrition, From Science to Life. US: Harcourt College Pub.
- Malaysia: Kuala Lumpur: IMR. Wardlaw, G.M. 2000. Contemporary Nutrition: Issues & Insights. 4th ed. US: Mc-Graw Hill.
- Murano, P.S. 2003. Understanding Food Science and Technology. Singapore: Thomson Learning, Inc.
- National Coordinating Committee on Food and Nutrition. 1999. Malaysian Dietary Guidelines. KL: Ministry of Health.
- P.M. & K.B. Sherrington. 1990. The Science of Food: An Introduction to Food Science, Nutrition and Microbiology. 3rd Edition. Oxford, England:
- Tee E.S, Mohd Ismail Noor, Mohd. Nasir Azudin, Khatijah Idris. 1997. Nutrient Composition of Malaysian Foods.
- Vierra, R.E. 1996. Elementary Food Science. 4th Edition. New York: Chapman and Hall.

### NT10703 MATHEMATICS

This course covers basic mathematics in calculus which comprises of topics such as: set, number, inequalities, relation and function, limits and continuity, complex number, differentiation and integration. This course also covers basic statistics: probability, random variable, discrete probability distribution, continuous probability distributions, random variable functions, hypothesis testing, linear regression and correlation.

#### References

- Smith R.T, Minton R.B. 2006. Calculus. McGraw-Hill: New York.
- Walpole dan Myers. 2001. Probability and Statistics (6th edition). Prentice Hall. New Jersey.
- Strauss M.J, Bardley G.L dan Smith K.J. 2002. Calculus. Prentice Hall. New Jersey.
- Triola M.F. 2001. Essentials of Statistics. Addison-Wesley Publishing Company. USA.
- Ajit C. Tamhane dan Dorothy D. Dunlop. 2005. Statistics and Data Analysis from Elementary to Intermediate. Prentice Hall. USA

### NT10903 ORGANIC CHEMISTRY

This course will discuss a few basic concepts and organic chemistry definitions so as students will be equipped with sufficient knowledge required for Food Chemistry course taught at higher level. This course covers nomenclature system, classification, structure and application for each group of natural and synthetic organic compounds. Emphasis will be given to the application of organic chemistry in food industries and daily life. Mechanisms of organic reaction and modern approaches used in synthesis of natural compounds will be also discussed.

#### References

- Brown, W.H & Thomas, P. 2005. Introduction to Organic Chemistry. 3rd Edition. New Jersey: John Wiley and Sons Inc.
- Graham, S. T.W. & Craig, F. B. 2000. Organic Chemistry. 8th Edition. New Jersey: John Wiley and Sons. Inc.
- McMurry John. 2003. Fundamentals of Organic Chemistry. 5th Edition. Thomson Brooks/Cole. USA.
- Bailey, Philip S. and Christina A. Bailey. 2000. Organic Chemistry. A Brief Survey of Concepts and Applications. 6th Edition. Prentice Hall. NJ, USA.
- Loudon, G. Marc. 2002. Organic Chemistry. 4th Edition. Oxford University Press. Oxford UK.

**NT11103 FOOD SENSORY EVALUATION**

Sensory evaluation of foods is widely used in the field of food science and technology for food quality control, assurance and product development. It is the measuring of food attributes through a complex sensation that results from the interaction of our senses such as taste, smell, touch and hearing when food is eaten. This course exposes the students to food attributes and overall food sensors such as gustation (taste), olfaction (smell), tactile (touch) and optic (vision). In addition, the concepts, principles and protocol of widely used sensory evaluation techniques will be emphasized. These include discriminative tests, descriptive tests, affective tests and scaling methods. Data collection and statistical analysis will be discussed in order to obtain accurate and valid test results.

**References**

- Aminah, Abdullah. 2000. *Prinsip Penilaian Sensori*, Bangi : UKM.
- Anuar, N., Husin, R. & Wales Nasarudin, S. 1992. *Analisis Deria untuk Makanan*. Dewan Bahasa dan Pustaka, Kuala Lumpur. Terjemahan: Piggott, J.R. *Sensory Analysis of Foods*. London: Elsevier Applied Science Publishers Ltd
- Hootman, R.C. 1992. *Manual on descriptive analysis testing for sensory evaluation*. ASTM Manual Series, MNL 13, Philadelphia.
- Lawless, H.T. 1998. *Sensory Evaluation of Food: Principles and Practices*. NY: International Thomson Pub.
- Meilgaard, M., Civille, G.V., Carr, B.T. 1999. *Sensory Evaluation Techniques*, 3rd ed., Boca Raton, Florida : CRC Press.

**NT10003 STATISTICS**

This course discusses basic statistical concepts including parametric and non-parametric tests. The practical component includes demonstrations and tutorials on statistical analyses using software. The software used is SPSS, version 14, which is one of the common statistical software used in academic research and industries. Students will be exposed to the use of syntax in statistical analyses.

**References**

- Armitage P, Berry G, Matthews JNS. *Statistical methods in medical research*. 4th ed. Oxford. Blackwell Sciences. 2001.
- Coakes SJ & Steed L (2007). *SPSS version 14.0 for Windows. Analysis without anguish*. Australia: John Wiley & Sons. 274 pages.
- Md. Idris Mohd . Noor (1995). *Asas statistik dan penyelidikan perubatan*. Kuala Lumpur: Dewan Bahasa dan Pustaka. 178 pages.
- Swinscow TDV & Campbell (eds.) *Statistics at square one*. 10th ed. British Medical Association. 2002. Useful little "cookbook", good for quick reference. Available online at: <http://www.bmj.com/collections/statsbk/> 160 pages.
- Ooi YBH (2007). *Statistics for food, nutritional and health sciences. Including SPSS user guide with syntax for analyses. Lecture notes* (pre-publication copy, limited circulation for registered students of SSMP only).

**NT10803 BIOCHEMISTRY**

This course discusses biochemistry and the main components of cells, the study of the molecules and their chemistry in reactions that facilitate the processes in a living organism / system. Topics cover enzyme structure, kinetics, mechanism and control; nucleic acid structure (DNA, RNA), biosynthesis and replication. Energy changes and electron transfer in metabolism of macronutrients (carbohydrate, fat, protein) which include glycolysis, the citric acid cycle, electron transport and oxidative phosphorylation are also discussed as well as biosynthesis and oxidation of fatty acids, synthesis and catabolism of amino acids.

**References**

- Campbell & Farrell. 2006. *Biochemistry (5th ed.)*. United States of America: Thomson Brooks / Cole.
- Conn, E.E., Stumpf, P.K. Bruening, G., Doi, R.H. 2003. *Outlines of Biochemistry*. Singapore: John Wiley & Sons.
- Horton, H.R., Moran, L.A., Scrimgeour, K.G., Perry, M.D., Rawn, J.D. 2006. *Principles of Biochemistry (4th ed.)* New Jersey: USA: Pearson Prentice Hall.
- Zubaidah Haji Abdul Rahim. 1992. *Pemakanan – Pendekatan dari Segi Biokimia*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

**NT11003 CELL BIOLOGY**

This course focused on cell types and its basic properties. Coverage will also include fundamental concepts such as the dynamic character of cellular organelles, the use of chemical energy in running cellular activities, cytoskeletons, replication and expression of cell, cell cycle and intracellular signalling.

**References**

- Alberts, B., Bray, D., Hopkin, K., Johnson, A., Lewis, J., Raff, M., Roberts, K. & Walter, P. 2010. *Essential cell biology*. 3rd edition. New York: Garland Science.
- Becker, W.M., Kleinsmith, L.J., Hardin, J. & Bertoni, G.P. 2009. *The world of the cell*. 7th edition. San Francisco: Benjamin Cummings.
- Bolsover, S.R., Hyams, J.S., Shephard, E.A., White, H.A. & Wiedemann, C.G. 2004. *Cell biology: A short course*. 2nd edition. New Jersey: Wiley & Sons.
- Karp, G. 2008. *Cell and molecular biology: Concepts and experiments*. 5th edition. New York: Wiley & Sons.
- Kleinsmith, L.J., Kish, V.M. 1995. *Principles of cell and molecular biology*. 2nd edition. New York: Harper Collins College.

**NT11203 PHYSICAL PROPERTIES OF FOODS**

A course discuss on those properties of foods that lend themselves to description and quantification by physical means. It is an introduction course exposing students to various physical properties of food, including the thermal, surface, optical, mechanical (rheological), electrical and geometrical properties. The definitions, theory and principles, methods of determination, as well as effects on food products are also discussed under relevant topics. This course also provides fundamental knowledge required in understanding advance courses offered in 2nd and 3rd year, such as Unit Operation in Food Processing and Food Engineering.

**References**

- Bourne, M. 2002. *Food Texture and Viscosity. Concept and Measurement*. London: Academic Press.
- Fellows, P.J. 2000. *Food Processing Technology. Principles and Practice*. Cambridge: Woodhead Pub.
- Karel, M. & Lund, D.B. 2003. *Physical Principles of Food Preservation*. 2nd Edition. New York: Taylor & Francis.
- Lewis, M.J. 1996. *Physical Properties of Foods and Food Processing Systems*. Cambridge: Woodhead Pub.
- Peleg, M. & Bagley, E.B. 1983. *Physical Properties of Foods*. Wesport: AVI Publishing Company, INC.
- MacDouga II, D.B. 2002. *Colour in Food: Improving Quality*. Cambridge: Woodhead Pub.
- Rao, M.A., Rizvi, S.S.H. & Datta, A.K. 2005. *Engineering Properties of Foods*. 3rd Edition. Singapore: Taylor & Francis.

**NT20703 FOOD ANALYSIS & INSTRUMENTATION**

This course introduces students to the importance of food analysis as chemical compositions of foods are used to determine the nutritive value, functional characteristics & acceptability of the food products. Students will be taught on preparation of chemicals & instruments to conduct the analyses. Analytical errors including those arising from impurity of chemicals, instruments & methods used will also be discussed. Students will learn how to report their laboratory results, findings & calculations. Proximate analyses, as well as the theory & suitable methods to determine moisture, ash, protein, lipid, carbohydrate, mineral and vitamin contents will also be explained. Students will also be exposed to specific instruments including AAS, GC, HPLC, etc., to analyse specific or basic components that make up our major food components.

**References**

- AOAC, 2000. *American Official Analytical Chemists*. 16th. Edition. Washington D.C.: Association of Analytical Chemists.
- Christian, G.O. and O'rielly J.E. 1986. *Instrumental Analysis*. 2nd Edition
- King, R.D. 1978. *Development In Food Analysis Techniques - 1*. Applied Science. London
- Nielsen, S.S. 2003. *Food Analysis*. Third Edition. New York: Kluwer Academic/Plenum Publishers.
- Nitise wojo, P. 1996. *Instrumentasi Dalam Analisis Makanan*. Bangi: Penerbit UKM.
- Pomeranz, Y. 1994. *Food Analysis: Theory and Practice*. London: Chapman and Hall Publication.

**NT20903 FOOD CHEMISTRY AND BIOCHEMISTRY**

This course explains the major components in foods, namely water, carbohydrate, lipid, protein and minor components such as vitamins and minerals. Students will be exposed to the chemical aspects, classification, characteristics, functional properties and major sources of each component. Other topics discussed include enzymes and the classification, uses of enzymes in food industries, browning process in foods and the effects to food quality. Biochemical changes in animal and plant commodities as well as bio-deterioration in food will be emphasis too.

**References**

- Alais, C. & Lin den, G. 1991. *Food Biochemistry*. Ellis Horwood Ltd. West Sussex, England.
- Coul ate, T.P. 1996. *Food - The Chemistry of Its Components*. 3rd. Edition. RSC, Cambridge, England.
- Eric, E.C., Paul, K.S. Goerge, B. & Roy, H.D. 1995. *Asas Biokimia*. Dewan Bahasa dan Pustaka. Kuala Lumpur (Terjemahan)
- Fennema, O.R. 1993. *Kimia Makanan, Jilid 1*. Kuala Lumpur: Dewan Bahasa dan Pustaka (Terjemahan)
- Mohd. Hamim, R., Baharudin, O. & Suhaina, S. 1997. *Pemakanan dan Kesihatan*. Dewan Bahasa dan Pustaka. Kuala Lumpur.

**NT20003 FOOD PROCESSING AND PRESERVATION**

This course will discuss about the principles and techniques of food processing and preservation such as freezing, drying, heat treatment, and so on. Students are required to understand the advantages and disadvantages for each of the preservation method. The effects of processing on food products (that affect the consumer acceptance) and the latest technology and development in food processing and preservation also being discussed.

**References**

- Barnard, M. & A. Bremner. 1995. *Print Buyeris Bible: Packaging*. Print Buyeris Series. London: Chapman and Hall.
- Gould, G. W. 1995. *New Methods of Food Preservation*. London: Blackie Academic and Professional.
- Mathlouthi, M. 1994. *Food Packaging and Preservation*. London: Blackie Academic and Professional.
- Rooney, M. 1995. *Active Food Packaging*. London: Blackie Academic & Professional
- Soleha Ishak. 1995. *Pengawetan Makanan Secara Pengerangan*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

**NT20203 FOOD MICROBIOLOGY**

The course discusses basic principles of food microbiology, which include scope of study, classification of microorganisms, existing of micro flora in various foods and their source of contamination. Characteristic and factors affecting the growth of microorganism that lead to either food spoilage or food poisoning are also discussed. An understanding to these factors is helpful in designing methods to control or stimulate their growth. Students have the opportunity to learn a wide variety of microbiological methods normally used in quality control and safety evaluation of foods. The control of microorganisms especially food borne pathogens by various food preservation techniques and processing are also being highlighted. Apart from its detrimentally effects to food and human health, many of these microorganisms are used in the production of food and food ingredients. A series of laboratory exercises are designed to provide student with the opportunity to develop skills in the isolation, identification and enumeration of the major groups of microorganisms associated with food and food products.

**References**

- Adams M.R. & Moss, M.O. 2008. *Food microbiology*. 3rd Edition. Cambridge: Royal Society of Chemistry.
- Garbutt, J. 1997. *Essential food microbiology*. London: Arnold International.
- Jay, M.J. 2000. *Modern food microbiology*. 6th edition. New York: Aspen Publisher.
- Ra y, B. 2003. *Fundamental food microbiology*. 3rd edition. Boca Raton: CRC Press
- Robinson, R., Batt, C.A & Patel. P. 1999. *Encyclopedia of food microbiology*. New York: ACA Press.
- Funke, B.R., Case, C.L. & Tortora, G.J. 2006. *Microbiology: An introduction*. 9th edition. London: Person Education Inc.
- Wilson, C.L. 2008. *Microbial food contamination*. Second edition. Boca Raton: CRC Press.

**NT30303 POST HARVEST HANDLING TECHNOLOGY**

The course teaches subjects related to the causes, principles and practices that result in food losses and appropriate methods to reduce post harvest losses in both the developed and developing countries in terms of technologic usage. The structure, composition and biophysical and biochemical changes in fruits and vegetables will be discussed. Factors that influence the quality of fruits and vegetables during storage will also be discussed. This course will also provide exposure to students on the technology of post harvest handling of cereals, cocoa, legumes, dairy products, meat, chicken and fish.

**References**

- Dell in o, C.V.J. 1990. *Cold and Chilled Storage Technology* London: Blackie Academic & Professional.
- Ismail, Noryati dan Che ah Poh Bee. 1998. *Lepas Tuai: Satu Pengenalan fisiologi dan Pengendalian Buah-buahan dan Sayur-sayuran*. Penerbit: USM. Terjemahan: Will, R.B.H., McGlasson, W.B., Graham, D., Lee, T.H. and Hall, E.G.
- Australia: Ne w South Wales University Press. Moeljantto. 1992. *Pengawetan dan pengolahan hasil perikanan*. Jakarta: Penebar Swadaya.
- Nagy, S. and Shaw, P.E. 1980 *Tropical and Sub-tropical fruits: composition, Properties and uses*. AVI Publishing Inc. Westport, Connecticut.
- Pantatico, E.B.1975. *Post harvest physiology, handling and utilisation of tropical And sub-tropical fruits and vegetables*. Westport, Con necticut: AVI Publishing Co., Ltd
- Potter, N.N. and Hotchkins, J.H. 1995 *Food Science*. New York: Chapman and Hall.
- Ray Herren. 1994. *The Science of Animal Agriculture*. Delmar Publisher Inc.
- Saadiah A. Shafie. 1995. *Asas Teknologi Biji benih* Kuala Lumpur: Dewan Bahasa dan Pustaka.
- Smith, J. 1991. *Food Additive User's Handbook*. London: Blackie Academic & Professional.
- Thompson, A.K. 1996. *Postharvest Technology of Fruits and Vegetable*. Westport, Connecticut: AVI Publishing Co., Ltd.
- Vickie, A.V. 1998. *Essential of Food Science*. New York: Chapman and Hall.

**NT30503 RESEARCH METHODS AND SCIENTIFIC WRITING**

This course discusses various experimental designs, and various stages in research studies from proposing a study to presenting its findings. Health and safety, study information, volunteer consent and ethics would also be discussed. This course should preferably be taken after NT10003 (Statistics).

**References**

- Kuehl RO (2000). *Design of experiments: statistical principles of research design and analysis*. 2nd ed. Singapore: Duxbury Press.
- Samuels ML & Witmer JA (2003). *Statistics for the life sciences*. 3rd ed. Ne w Jerse y: Perason Education Inc (UMS Library QH 323.5.S23)
- Del Vecchio RJ (1997). *Understanding design of experiments: a primer for technologists*. New York: Hanser/Gardner Publications Inc.
- Dean A & Voss D (1999). *Design and analysis of experiments*. New York: Springer. (UMS Library QA 279.D43)
- Webner DC & Skillings JH (2000). *A first course in the design of experiments. A linear models approach*. New York: CRC Press. (UMS Library QA 279.W4)

**NT30703 FOOD SAFETY AND QUALITY CONTROL**

This course emphasizes the importance of food safety and quality assurance for the food industry. Among the food safety programs discussed include Hazard Analysis Critical Control Point (HACCP), Good Manufacturing Practice (GMP) and Food Hygiene. In addition, students will be introduced to various aspects of quality control and its roles in the food industry, particularly on certain high-risk foods such as poultry and meat products, dairy products and vegetables/fruits. The basic tools of statistical quality control, sampling, inspection and data organization are made palatable by using examples from the food industry to provide students with case studies and promote critical thinking on quality issues. A variety of quality attributes and techniques for objective evaluation based on instrumental measurement are also discussed.

**References**

- Alli, I. 2003. Food quality assurance: principles and practices. Boca Raton: CRC Press.
- Brown, M. and Stringer, M. 2002. Microbiological risk assessment in food processing. North America: Woodhead Publishing Limited.
- Forsythe, S.T & Hayes, P.R. 1998. Food hygiene, microbiology and HACCP. 3rd edition. Aspen Pub. New York.
- Mortimore, S.E., Wallace, C.A. & Cassianos, C.A. 2001. HACCP. Food Industry Briefing Series. Oxford: Blackwell Publishing.
- Newslow, D.L. 2001. The ISO 9000 Quality system. Applications in food and technology. New York: Wiley Interscience.

**NT40003 FOOD LEGISLATION AND STANDARDS**

This course emphasizes the legislation and standards of food that are commonly practiced by the food industry to ensure their products are safe and fulfilling the specifications. The course content includes food regulations in the country (Food Act 1983 and Food Regulation 1985) and several international standards or guidelines pioneered by the expert committees or international organizations such as Codex Alimentarius Commission (CAC), WHO, Food & Drug Administration (FDA) and FAO. The course will stress the importance of safety and quality issues related to all types of foods in the international business. Other aspects to be discussed include quality management systems which are used by the food industry such as ISO 9000, halal certification and Total Quality Management (TQM).

**References**

- Alli, I. 2003. Food Quality Assurance: Principles and Practices. Boca Raton: CRC Press.
- Food Act 1983 and Food Regulation 1985 (Amendment till Oct 2005). Kuala Lumpur: MDC Publisher Printers.
- Forsythe, S.T & Hayes, P.R. 1998. Food hygiene, microbiology and HACCP. 3rd edition. New York: Aspen Pub.
- Goodburn, E. 2001. EU Food Law: A Practical Guide. Boca Raton: CRC Press
- Newslow, D.L. 2001. The ISO 9000 Quality System Applications in Food and Technology. Texas: Culinary and Hospitality Industry Publications Services.

## FOOD TECHNOLOGY AND BIOPROCESS PROGRAMME (HY07)

### NB20303 FOOD BIOPROCESSING

This course covers the role and importance of bioprocessing in food industry. Traditional and modern biotechnology will be defined. The use of biological organisms, systems or processes such as fermentation technology, enzyme technology, production of single cell protein (SCP) and genetically modified food (GMF) in the food industry will be discussed. Cell activity control and basic genetic engineering will also be discussed in further detail.

#### References

- Lee, B. H. 1996. *Fundamental Of Food Biotechnology*. New York: VCH Publishers
- Lee, Y. K. 2003. *Microbial Biotechnology: Principles and Applications*. Singapore: World Scientific Publishing
- Mattsson, B. & Sonesson, U. 2000. *Environmentally-friendly Food Processing*. Cambridge: Woodhead Publishing
- Prave, P., Faust, U., Sittig, W. & Sukatsch, D.A. 1987. *Fundamentals of Biotechnology*. Weinheim: VCH Verlagsgesellschaft
- Shuler, M.L. & Kargi, F. 2002. *Bioprocess Engineering: Basic Concepts*. New Jersey: Prentice-Hall
- Thompson, P. B. 1997. *Food Biotechnology in Ethical Perspective*. London: Blackie Academic & Professional
- Wood, B.J.B. 1998. *Microbiology of Fermented Foods*. 2nd Edition. Volume I & II. London: Blackie Academic & Professional.

### NB20103 BAKERY TECHNOLOGY AND CONFECTIONARY

This course is attempted to expose students to the technologies currently employed in bakery and confectionary industries. This involves all knowledge related to the development and technology bakery/confectionary, use of raw materials, popular bakery/confectionary products, manufacturing methods, utilization of machineries and equipments, quality control, packaging, cleanliness and sanitation as well as nutrition. Students are also given a chance to produce bakery and confectionary products during laboratory exercises.

#### References

- Amendola, J. 1993. *The Baker's Manual*. 4th Edition. New York: Van Nostrand Reinhold.
- Beckett, S.T. 2000. *The Science of Chocolate*. London: Royal Society of Chemistry.
- Bennion, E.B., Barnford, G.S.T. & Bent, A.J. 1997. *The Technology of Cakemaking*. London: Blackie Academic & Professional.
- Jackson, E.B. 1995. *Sugar Confectionery Manufacture*. London: Chapman & Hall.
- Manley, D.J.R. 2000. *Technology of Biscuits, Crackers and Cookies*. Boca Raton: CRC Press.
- Matz, S.A. 1991. *Bakery Technology and Engineering*. 3rd Edition. London: Blackie Academic & Professional.
- Minifie, B.W. 1999. *Chocolate, Cocoa and Confectionery: Science and Technology*. 3rd Edition. New York: Van Nostrand Reinhold.

### NB20003 UNIT OPERATIONS IN FOOD PROCESSING

This course introduces basic units in food industry, which involves various food processing operations. Students will be exposed to important unit operations in food processing such as fluid flow, heat transfer, drying, evaporation, contact equilibrium separation processes, mechanical separations, size reduction processes, and mixing. This course will be a basis for food engineering process where selection of reasonable raw material can be carried out, plant can be conducted efficiently, safely and cost effectively as well as able to meet requirements by consumers.

#### References

- Brennan, J.G., Butters, J.R., Cowell, N.D. dan Lilley, A.E.V. 1990. *Food Engineering Operations*. Chapman and Hall, London.
- Che Man, Yaakob, Wan Abdullah, Wan Jamilah dan Abdul Rahman, Rusly. 1995. *Asas Kejuruteraan Pemprosesan Makanan*. Dewan Bahasa dan Pustaka, Kuala Lumpur.  
Translation: Toledo, R.T. *Fundamentals of Food Processing Engineering*. Van Nostrand Reinhold, New York.
- Ibrahim, Muhamad Hakimi dan Ismail, Hanafi. 1993. *Operasi Unit dalam Pemprosesan Makanan*. Penerbit USM. Translation: Earle, R.L. *Unit Operations in Food Processing*. Pergamon Books Ltd, Oxford.
- Singh, R.P. dan Heldman, D.R. 1993. *Introduction to Food Engineering. Second Edition*. Academic Press Limited, London.
- Valentas, K.J., Rotstein, E. and Singh, R.P. 1997. *Handbook of Food Engineering Practice*. CRC Press LLC, New York.

**NB20002 MEAT AND SEAFOOD TECHNOLOGY**

This course stresses the importance of both the theoretical and practical aspects of meat products and seafood (including selected seaweeds) processing. Students will be acquainted with the composition and structure of meat / seafood, post-harvest chemical changes in meat / fish, determination of quality of the meat / seafood and factors affecting it, equipment, technology and ingredients used in meat products and seafood processing. Factors which affect the carcass quality during processing will also be discussed. Issues like animal handling from an international perspective, slaughter, and management of processing wastes will also be scrutinised.

**References**

- Bremner, H.A. 2002. Safety and Quality Issues in Fish Processing. Cambridge: Woodhead Publishing Limited.
- Feiner, G. 2006. Meat Products Handbook: Practical Science and Technology. Cambridge: Woodhead Publishing Limited.
- Hui, Y. H., Nip, W-K. & Rogers, R. 2001. Meat Science and Applications. Boca Raton: CRC Press.
- Kerry, J., Kerry, J. & Ledward, D. 2002. Meat Processing: Improving Quality. Boca Raton: CRC Press.
- Lawrie, R.A. 2006. Lawrie's Meat Science. 7th edition. Cambridge: Woodhead Publishing Limited.
- Venugopal, V. 2006. Seafood Processing: Adding Value Through Quick Freezing, Retortable Packaging and Cook-Chilling. New York: CRC Press.

**NB30103 FOOD PACKAGING**

Fundamental principles in food packaging will be discussed in this course. Among the topics discussed are the functions of packaging, consumer trend, type of common raw materials used in food packaging, chemical and mechanical properties of packaging and general terminology in description of packaging characteristics and so on. Students will also be exposed to the innovations evolved in food packaging process / system to suit the market demand. The most up-to-date developments, trends and current issues in food packaging will be highlighted.

**References**

- Ahvenainen, R. 2003. *Novel Food Packaging Techniques*. Cambridge: Woodhead Publishing Limited.
- Brody, A.L., Strupinsky, E.R. & Kline, L.R. 2001. *Active Packaging for Food Applications*. Boca Raton: CRC Press
- Coles, R., McDowell, D. & Kirwan, M.J. 2003. *Food Packaging Technology*. Boca Raton: CRC Press.
- Giles, G.A. 2000. Design and Technology of Packaging Decoration for the Consumer Market. Boca Raton: CRC Press.
- Han, J.H. 2005. *Innovations in Food Packaging*. Amsterdam: Elsevier Academic Press.
- Robertson, G.L. 2006. *Food Packaging. Principles and Practice*. 2nd edition. New York: Taylor & Francis.

**NB30012 INDUSTRIAL TRAINING AND SEMINAR**

Each third year student will be placed in selected food industry or research institution to gain experiences suitable to the course program. The training will last for one semester. Students are required to write a report and later present in a seminar. Students will be evaluated by the supervisor of the industry where they attach to, meanwhile, school (lecturers) will also visit the workplace to discuss the performance of students during attachment. The total mark of this course comes from the marks of the industrial supervisor, the visiting lecturer, report and presentation of industrial attachment.

**NB40103 ENZYMES IN FOOD PROCESSING**

The historical uses of enzymes to make beer, wine, cheese and bread are fine examples of the industrial exploitation on its catalytic function and selectivity. This course covers the basic and applied aspects of the enzymology important to food systems. The basic aspects of the course include the basic enzyme properties, factors that affect enzyme activity and methods of measuring enzymatic activities. In the other hand, the applied aspects focusing on the enzymes used by the food industry and methods or controlling endogenous enzyme activities.

**References**

- Aehle, W. 2004. *Enzymes in industry : production and applications*. Weinheim : Wiley-VCH
- Nitise wojo, P. 1990. *Enzimologi makanan*. Kota Kinabalu: UMS
- Palmer, T. 1995. *Understanding enzymes*. 4th edition. Hertfordshire: Prentice Hall
- Tucker, G. A. L. F. & Woods, J. 1995. *Enzymes in food processing*. London : Blackie Academic and Professional
- Whitaker, J. R. 1994. *Principles of enzymology for the food science*. New York : Marcel Dekker
- Whitaker, J. R., Vorgen, A. G. J., Wong, W. S. 2003. *Handbook of food enzymology*. New York : Marcel Dekker
- Whitehurst, R. J. & Law, B. A. 2002. *Enzymes in food technology*. Sheffield : Sheffield Academic Press



**NB40303 FOOD PRODUCT DEVELOPMENT**

The importance of development of industrial food products from the aspect of consumer and manufacturer needs to be learnt. This course encompasses the study of basic strategies in food products development, starting from idea generation, experiment, product tests in experiment, prototype production, product specification, manufacturing and marketing.

**References**

- Fuller, G.W. 1994. *New Food Product Development from Concept to Marketplace*. Contemporary Food Science Series. Ohio: CRC Press.
- Jones, T. 1996. *New Product Development: A Multi-Functional Process*. London: Butterworth Heineman.
- Moss, M.A. 1995. *Applying TQM to Product Design and Development*. New York: Marcel Dekker Publication.
- Revelle, J.B., Frigon, N.I. & Jackson H.K. Jr. 1995. *From Concept to Consumer*. New York: Van Nostrand Reinhold.
- Wheelwright, S.C. & Clark, K.B. 1995. *Leading Product Development*. Singapore: Simon & Schuster Asia Pte.Ltd.

**NB40503 FOOD FERMENTATION**

The course covers a wide range of food fermentation processes applied worldwide either for product development or as a preservation method. Topics to be discussed in the course include importance and characteristics of microorganisms used in various fermented foods, their health benefits and microbial or enzymatic processing of food and food ingredients to achieve desirable shelf life and favour. In addition, the microbiological consideration in the production of fermented foods, their natural antimicrobial by-products, application of genetic and recombinant DNA for starter improvement as well as their impact on functional properties of foods will be discussed. Equally important is the safety issues related to fermented foods and food ingredients. Students will have the opportunity to run fermentation process in laboratory to produce fermented food products and study the basic requirements for food fermentation.

**References**

- Campbell-Platt, G. 2001. *Fermented foods of the world*. Second edition. New York: CRC Press
- Lea, A.G.H. & Piggot, J.R. 1995. *Fermented beverage production*. New York: Aspen Publisher Inc
- Salminen, S & A. V. Wright. 1998. *Lactic acid bacteria: Microbiology and Functional Aspects* Second Edition. Marcel & Dekker Inc.
- Wood, B.J.B. 1998. *Microbiology of fermented foods*. Second edition. Volume I and II. London: Blackie Academic & Professional.

**NB00103 RESEARCH PROJECT I**

This course is specifically designed to allow final year students to gain experience in conducting research. Each student is required to take a total of nine credit hours for one research project (throughout two semesters) under the supervision of an academic; three credit hours will be evaluated in this course. Students will pick their research topic from a list of project titles which is given by all academics on the first week of semester. Student are advised to contact their supervisors for detailed information regarding the research that they will be doing, and then determine the agreed work targets. Students are required to present their research proposals before starting laboratory work. This will give students opportunities to get feedback or alternative views about their proposed research, especially regarding study designs and analytical techniques.

**References**

- UMS. 2000. Kaedah penulisan tesis/disertasi/latihan ilmiah. Gugusan Sains. Universiti Malaysia Sabah.

**NB40003 SPECIAL TOPICS**

This course discusses current issues faced by the food industry including new technologies to process and preserve food. The technical aspects of these technologies, their impact on the environment and commercial-ability will be discussed. Short-term and long-term benefits as wells as weaknesses also need to be made known. For example, genetic engineering is gaining popularity with its own groups of advocates and detractors. These topics will be discussed in detail to understand the science behind them.

**References**

- Barbosa-Canovas, G.V & Zhang, Q.H. 2002. *Pulsed electric fields in food processing*. Texas: Culinary & Hospitality Industry Publication Services.
- Barbosa-Canovas, G.V., Tapia, M. & Cano, M.P. 2004. *Novel food processing technologies*. Texas: Culinary & Hospitality Industry Publication Services.
- Kudra, T. & Mujumar, A.S. 2001. *Advanced drying technologies*. Texas: Culinary & Hospitality Industry Publication Services.
- Loza no, J.E. 2000. *Trends in food engineering*. Texas: Culinary & Hospitality Industry Publication Services.
- Ohlsson, T. Bengtsson, N. 2002. *Minimal processing in food industry*. Texas: Culinary & Hospitality Industry Publication Services.

**NB40203 FOOD ENGINEERING**

The course attempts to discuss basic principles of engineering and momentum transfer for applications in food processing operations. Discussion will be focussed on general concept fluid flow, Newton and non-Newton fluid, thermodynamics and equilibriums in momentum and energy.

**References**

- Brennan, J.G., Butters, J.R., Cowell, M.D. & Lilley, A.E.V. 1990. Food Engineering Operations. 3rd Edition. London: Blackie Academic & Professional.
- Fryer, P.J. 1996. Chemical Engineering for the Food Industry. London: Chapman and Hall.
- Lydersen, B., DiElia, N.A. & Nelson, K.L. 1994. Bioprocess Engineering: Systems, Equipment And Facilities. Singapore: John Wiley & Sons (Asia).
- Spiess, W.E.L., & Schubert, H. 1990. Engineering and Food: Advanced Processes. London: Blackie Academic & Professional.
- Toledo. T.T. 1991. Fundamentals of Food Process Engineering. London: Chapman & Hall – Terjemahan DBP (1995) oleh Yaakob Che Man & Rakan-rakan

**NB40403 FATS AND OIL TECHNOLOGY**

Topics covered including composition and properties of edible fat/oil, extraction and analysis for fat, methods of transfatty acid analysis, oil manufacturing technology, oil modification processes such as interesterification and hydrogenation. Besides, fat oxidation in food and tissue, fat and antioxidant reaction mechanisms and fat biotechnology will be discussed. Emphasis is also given to local fat/oil industry like manufacturing of palm oil and cocoa fat. The current issues relevant to the nutrition of fat/oil as well as the health implications of transfatty acid particularly will be highlighted.

**References**

- Akoh, C.C. & Min, D.B. 2002. Food Lipids: Chemistry, Nutrition and Biotechnology. Boca Raton: CRC Press.
- Chow, C.K. 2000. Fatty Acids in Foods and Their Health Implications. 2nd Edition. Boca Raton: CRC Press.
- Gunstone, F.D. 1996. Fatty Acid and Lipid Chemistry. Springer
- Gunstone, F.D. 2004. The Chemistry of Oils and Fats: Sources, Composition, Properties, and Uses. Boca Raton: CRC Press.
- Hamm, W. & Hamilton, J. 2000. Edible Oil Processing. Boca Raton: CRC Press.
- O'Brien, R.D. 2004. Fat and Oils: Formulating and Processing for Applications. Boca Raton: CRC Press

**NB00206 RESEARCH PROJECT II**

This course is the continuation to NB00103 Research I, where students are required to complete their ongoing research project. In this course, students will focus on Project laboratory analyses and field work. At the end of the project, students will report their findings in the form of a dissertation which will be submitted for examination by two examiners (not including the supervisor) who will be appointed by the course coordinator. All dissertations submitted for examination must adhere to the scientific writing style and standards approved by UMS. Each student will be called to defend his/her dissertation in an oral examination which will be conducted after submission of the dissertation.

**References**

- UMS. 2000. Kaedah penulisan tesis/disertasi/latihan ilmiah. Gugusan Sains. Universiti Malaysia Sabah.

## FOOD SCIENCE AND NUTRITION PROGRAMME (HS04)

### NP20303 HUMAN NUTRITION

This course discusses the importance, function and requirements of nutrients such as carbohydrate, protein, fats, minerals, vitamin and water and their relationship to health. Students will be exposed to the digestive system and the digestion of each nutrient as related to the intake of a well balanced diet. The structure, function, sources of food and the danger of deficiency or over consumption of various nutrients to the body will be taught to the students. Malnutrition, anthropometrics measurement and nutritional status of individuals will be discussed in lecture and lab.

#### References

- Garrow, J.S., James WPT, Ralph A. 2000. *Human Nutrition and Dietetics (10th ed)*. UK: Churchill Livingstone.
- Grosvenor, MB & Smolin LA. 2002. *Nutrition, From Science to Life*. US: Harcourt College Pub.
- Lee, R.D & Nieman, D.C. 2003. *Nutritional Assessment*. 3rd ed. Boston, MA: McGraw-Hill.
- Suriah, A.R. 1993. *Memahami Pemakanan*. Kuala Lumpur: DBP.
- Tee, E.S, Ismail, M.N, Nasir, M.A & Khatijah, I, 1997. *Nutritional Composition of Malaysian Foods*. Kuala Lumpur, Asean Food Habits Project.
- Wardlaw, G.M. 2000. *Contemporary Nutrition: Issues & Insights*. 4th ed. Boston Massachusetts: Mc-Graw Hill.
- Whitney, E.N, Cataldo, C.B & Rolfes, S.R. 2002. *Understanding Normal and Clinical Nutrition*. 6th ed. Belmont, CA: Wadsworth.
- Zubaidah Haji Abdul Rahim. 1992. *Pemakanan-Pendekatan Dari Segi Biokimia*. Kuala Lumpur: DBP.

### NP20103 MOLECULAR NUTRITION

This course is an introduction into nutrition at the molecular level, which is a rapidly developing research area. Students will be exposed to nutrigenomics, proteomics, polymorphisms and their effects on gene–gene and gene–nutrient interactions. The most recent studies will be emphasised in every topic of discussion. After completing this course, students should understand how diet interacts with genes. From this understanding, students will be able to think of strategies to decrease risks of selected diseases which are becoming epidemics.

#### References

- Emer y P, Sanders T. (2002). *Molecular basis of human nutrition (lifelines)*.
- Lucock M. 2007. *Molecular nutrition and genomics: nutrition and the ascent of humankind*.
- Zempleni J, Daniel H. 2003. *Molecular nutrition*. London: Cabi Publishing.

### NP20003 NUTRITION IN THE LIFE CYCLE

This course discusses the changing physiology and nutritional requirements as well as related health and nutritional concerns occurring in the different stages of the life cycle such as in pregnancy and lactation, infancy, childhood, adolescence, adulthood and during the late years of life. Methods of nutritional assessment specific for each age group will also be covered.

#### References

- Bhatia, J. 2004. *Perinatal Nutrition: Optimizing Infant Health & Development*. Nutrition and disease prevention series, Vol2. Boca Raton: CRC Press.
- Brown, J.E., Isaacs, J.S, Krinke, U.B, Murtaugh, M.A, Stang, J & Wooldridge, N.H. 2002. *Nutrition Through the Life Cycle*. USA: Wadsworth/Thomson Learning.
- Garrow, J.S., James WPT, Ralph A. 2000. *Human Nutrition and Dietetics (10th ed)*. UK: Churchill Livingstone.
- Grosvenor, MB & Smolin LA. 2002. *Nutrition, From Science to Life*. US: Harcourt College Pub.
- Lee, R.D & Nieman, D.C. 2003. *Nutritional Assessment*. 3rd ed. Boston, MA: McGraw-Hill.
- Parizkova, J. & Hills, A.P. 2005. *Childhood Obesity Prevention and Treatment*, Second Edition. Boca Raton: CRC Press.
- Suriah Abd ul Rahman & Tengku Aizan Hamid. 2001. *Pemakanan Warga Tua*. KL: DBP.
- Wardlaw, G.M. 2000. *Contemporary Nutrition: Issues & Insights*. 4th ed. Boston Massachusetts: Mc-Graw Hill.

### NP20002 FOOD HABITS AND NUTRITION EDUCATION

This course discusses food habits which are practised by people of various ethnic backgrounds and religious observations in Malaysia. Based on the identified food habits, students will be exposed to various pedagogical and androgical methods in delivering nutrition education to society.

#### References

- Carter A, Bell S. 1987. *Food in focus: a nutrition education programme for health educators*.
- Field house P. 1996. *Food and nutrition. Customs and culture*. London: Stanley Thomas.
- FAO (Food and Agriculture Organisation of the United Nations). 1997. *Nutrition education for the public: discussion papers of the FAO Expert Consultation (Food & Nutrition papers)*.
- Ooi YBH. 2009. *Food and nutrition of Malaysians: customs and culture*. Kota Kinabalu: Penerbit UMS (manuscript to be published).
- Webb G. 2002. *Nutrition: a health promotion approach*. Hodder Arnold Publication.

**NP30103 COMMUNITY NUTRITION**

This course rests upon the fundamentals introduced in NP20003 (Nutrition in the life cycle) which explored nutritional needs brought about by physiological changes throughout the life cycle and age-gender specific nutritional assessment methods and NP20303 (Human Nutrition) which covered dietary assessment methods. This course will look at practical methods to evaluate nutritional status at the community level using anthropometric, dietary assessment methods, and biochemical indexes, e.g., designing and validating a food frequency questionnaire for calcium intake among low-income women in urban areas. A systems approach in designing nutrition interventions will be discussed during lectures, followed by planning of an intervention project in selected areas / communities. Nutritional policies and existing intervention programmes in place in Malaysia and at the international level will be explored. Food security and health inequalities in Malaysia will also be addressed.

**References**

- Bonnie, S. W. R & Sue, R. W. 1996. *Nutrition throughout the life cycle*. St. Louis MO: Mosby-Year Book, Inc.
- Guthrie, H. A & Picciano, M. F. 1995. *Human Nutrition*. St. Louis, MO: Mosby-Year Book, Inc.
- Owen, Splett & Owen. 1999. *The Art and Sciences of Delivering Services, Fourth edition*. New York: WCB/ McGraw-Hill Companies.
- Suriah, Abd. Rahman, Narimah, Abd. Karim, Aminah, Abdullah, Azizah, Abd. Hamid & Fatimah Arshad, 1993. *Makanan dan Pemakanan Terapi Diet*. Kuala Lumpur: Dewan Bahasa dan Pustaka (terjemahan) Krause, M. V & Mahan, L.K. *Food, Nutrition and Diet Therapy*. West Washington Square, Philadelphia W. B. Saunders Company.
- Whitney, E. N & Rolfes, S. R. 1999. *Understanding Nutrition*, 8th ed. Belmont: CA, Prentice-Hall.

**NP30012 INDUSTRIAL TRAINING AND SEMINAR**

Each third year student will be placed in selected food industry or research institution to gain experiences suitable to the course program. The training will last for one semester. Students are required to write a report and later present in a seminar. Students will be evaluated by the supervisor of the industry where they attach to, meanwhile, school (lecturers) will also visit the workplace to discuss the performance of students during attachment. The total mark of this course comes from the marks of the industrial supervisor, the visiting lecturer, report and presentation of industrial attachment.

**NP40103 FOOD TOXICOLOGY**

This course aims to give students an overview of principles in food toxicology including the application of these principles to qualitative and quantitative toxicological testing of food products. The occurrence of various natural toxicants in food either from plants or animal origin will be discussed. Other topics include pesticides residues, food additives and contaminants, byproducts originating from food processing as well as implication of industrial waste on human health and environment. Today food toxicology relies heavily on the knowledge in chemical and biological field and assumes that the students have an understanding of the basic concepts of human physiology and biochemistry. Therefore it is important for the student of food science and nutrition that they should be aware of the properties and mode of action and methods of analysis for the various toxic compounds.

**References**

- Curtis D. Klaassen. 2001. *Casarett And Doull's Toxicology: The Basic Science of Poisons*. 6th Edition. McGraw-Hill Companies, Inc., USA.
- Deshpande S. S. 2002. *Handbook of Food Toxicology*. Marcel Dekker, Inc. New York, USA
- DeVries, J. 1997. *Food safety and toxicity*. CRC Press LLC, New York, USA.
- FAO, 2001. *Genetically modified organisms, consumers, food safety and the environment*. Food and Agriculture Organization, Rome. Ethics Series No. 2
- Helferich & Winter. 1998 *Food toxicology*. New York: Kluwer Academic Press.
- Moffat, C & Whittle, K.J. 1999. *Environmental Contaminants in Food*. New York: CRC Press
- Shibamoto, T & Bjeldanes, L.F 1993. *Introduction to food toxicology*. New York: Academic Press
- Stanley Manahan. 2003. *Toxicological Chemistry and Biochemistry*, Third Edition. Lewis Publishers. CRC Press LLC. New York, USA.
- Stanley T. Omaye. 2004. *Food and Nutritional Toxicology*. CRC Press LLC. New York, USA.

**NP40303 DIETETICS**

This course exposes students to optimal and quality management of dietetics. Students will learn diet therapy and dietary changes, draw up nutrient requirements, as well as manage and ensure the correct diet plans for patients. Students are also required to identify interactions between medication and food intake as well as several techniques in management of clinical nutrition.

**References**

- Aronson, V, Fitzgerald, B, & Hewes, L. V. 1990. *Guidebook for Nutrition Counselors, 2nd. Edition*. New Jersey: Prentice Hall.
- Dorland's pocket. 1982. *Medical Dictionary, 23rd. Edition*. Philadelphia: W. B. Saunders Company.
- Lee, R. & Nieman, D. C. 1999. *Nutritional Assessment: Clinical, Dietary, Anthropometric And Biochemical, 2th. Edition*. St. Louise: Mosby-Year Book. Inc.
- Romman- Lopes, C, Litoff, C. & Israel, D. 1988. *Diet Modification: A Practical Manual*, Philadelphia: George F. Stikley company.
- Whitney, E. N & Rolfes, S. R. 1999. *Understanding Nutrition, 8th. Edition*. Belmont, CA: Wadsworth Publishing.

**NP40503 FOOD INGREDIENTS AND FUNCTIONS**

This course is intended to give insight about the chemistry, sources, and the commercial value of the various food ingredients. It will discuss both the natural and synthetic food ingredients as well as issues related to the development of new food ingredients and their applications in food industries including food processing and preservation technologies. Usage of various food ingredients and its attendant concerns and risks vis a vis diet, nutrition and health will also be explored.

**References**

- Anonymous, 1995. *Food Additives: U.S Products, Applications, Markets*. Technomic Publishing, Lancaster, PA.
- Belitz, H.-D., Grosch, W., Schieberle, P. 2004. *Food Chemistry*. 3rd Revised Edition. Springer-Verlag, Berlin Heidelberg Germany.
- Robert S. Igoe., Hui, Y.H. 2001. *Diction ary of food ingr edients*. 4th Edition. Aspen Publishers, Inc. Gaithersburg, Maryland, USA.
- Guy Linden a nd Denis Lorient. 1999. *New Ingredients in food processing Biochemistry and agriculture*. Woodhead Publishing Limited, Cambridge, England.
- Larry Branen, A., Michael Davidson P. Seppo Salminen, John H. Thorngate III. 2002. *Food Additives*. 2nd Edition. Arcel Dekker, Inc. New York, USA.

**NP00103 RESEARCH PROJECT I**

This course is specifically designed to allow final year students to gain experience in conducting research. Each student is required to take a total of nine credit hours for one research project (throughout two semesters) under the supervision of an academic; three credit hours will be evaluated in this course. Students will pick their research topic from a list of project titles which is given by all academics on the first week of semester. Student are advised to contact their supervisors for detailed information regarding the research that they will be doing, and then determine the agreed work targets. Students are required to present their research proposals before starting laboratory work. This will give students opportunities to get feedback or alternative views about their proposed research, especially regarding study designs and analytical techniques.

**References**

- UMS. 2000. *Kaedah Penulisan Tesis/disertasi/latihan ilmiah*. Gugusan Sains. Universiti Malaysia Sabah.

**NP40003 SPECIALISED TOPICS**

This course discusses issues at the frontiers of research and applications in food industries including new food processing and preservation technologies, and innutritional sciences. Ethical concerns of these research and technologies would also be discussed. Technical aspects, environmental impacts and commercial viability / financial limitations of these technologies would be explored. For example, genetic engineering is increasing in popularity, both in usage and controversies associated with its usage; arguments for and a gainst all issues presented in this course will be explored. The science behind issues chosen for study would also be explored in detail.

**References**

- All materials will be online. Students are encouraged to refer to various credible, evidence-based resources. There is NO NEED to specifically purchase a "textbook" for this course. Use the library.

**NP40203 FOOD SERVICE**

This course will expose students to food service segmentation such as food service in commercial areas (e.g., airlines, cruises, restaurants, fast food and private catering services), non-commercial areas (e.g., country club restaurant, zoos and sports events) and in institutional areas (e.g., hospitals, universities, schools, prisons, armies). Students will also gain knowledge in kitchen and administration areas. These include the kitchen area in preparation of food in bulk, purchasing method for raw food, storage for raw food and prepared food, transportation of prepared food, cleaning and sanitation in kitchen. In administration, it covers menu planning, staff management, kitchen operation management and other related aspects in food service management.

**References**

- Mc Williams M., 1997. *Foods: Experimental Perspectives Third edition*. New York: McMillan Publishing Company. (main reference).
- Brown A., 1999. *Understanding Food: Principles and Preparation*. Belmont, CA: Wadsworth/ Thomson.
- Don ovan D. M., 1997. *Cooking Essentials for The New Professional Chef. The Food And Beverage Institute*. New York: John Wiley & Sons
- Drummond K. E., 1996. *Nutrition for Foodservice Professional Third Edition*. New York: Van Nostard Reinhold.
- Labensky S.R., and House A. M. 1995. *On Cooking a Textbook on Culinary Fundamentals*. New Jersey: Prentice Hall.
- Payne-P alacio J., Theis M., 1997. *West & Wood's: Introduction to Foodservice. 8th edition*. London: Prentice Hall International. (main reference).
- Powers T., 1995. *Introduction to the Hospitality Industry*. New York: John Wiley & Sons Inc.
- Ran de L. W., 1996. *Introduction to Professional Foodservice*. USA: John Wiley & Sons Inc.
- Spears C. M., 2004. *Foodservice Organisation: A Management and System Approach*. London: Pearson /Prentice Hall. (main reference).

**NP00206 RESEARCH PROJECT II**

This course is the continuation to NP00103 Research Project I, where students are required to complete their ongoing research project. In this course, students will focus on laboratory analyses and field work. At the end of the project, students will report their findings in the form of a dissertation which will be submitted for examination by two examiners (not including the supervisor) who will be appointed by the course coordinator. All dissertations submitted for examination must adhere to the scientific writing style and standards approved by UMS. Each student will be called to defend his/her dissertation in an oral examination which will be conducted after submission of the dissertation.

**References**

UMS. 2000. Kaedah penulisan tesis/disertasi/latihan ilmiah. Gugusan Sains. Universiti Malaysia Sabah.

**NP40403 DIET THERAPY**

This course is better taken after completion of NP40303 Dietetics although this does not amount to a pre-condition. Progressing from NP40303, this course will look with greater detail into management of nutritional support which is different from nutrition recommendations for healthy individuals. The relationship between feeding and metabolism will be studied in greater detail. The focus of this course will be management of diet therapies in selected diseases which occur throughout the lifecycle where patients would benefit from such therapies.

**References**

Cataldo CB, DeBruyne LK, Whitney EN 2003. *Nutrition and diet therapy*. 6th ed. Belmont, CA: Wadsworth/Thomson Learning.

Gibney MJ, Elia M, Ljungqvist O, Dowsett J (eds.) 2003. *Clinical nutrition (The Nutrition Society textbook)*. London: Blackwell Publishing.

Mahan LK, Escott-Stump S. 2004. *Krause's food, nutrition and diet therapy*. Philadelphia, PA: Saunders-Elsevier. Suriah Abd. Rahman (Terjemahan). 2003. Krause MV,

Mahan LK. *Makanan, pemakanan dan diet terapi*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

Thomas B, Bishop J (eds.). 2007. *Manual of dietetic practice*. 4th ed. London: Blackwell Publishing.

## FOOD SERVICE PROGRAMME (HG09)

### NF20103 FUNDAMENTALS OF FOOD SERVICE

The courses introduce history of foodservice, different category of foodservice operation that already been the based of all foodservice today. Students will learn basic theory of menu, purchasing method, marketing, storage and food sanitation on these courses. They will be introduce the food pyramid concept on different country including Malaysia and learn the basic food composition.

#### References

- Gielisse, V., Kimbrough, M., and Gielisse, L. 1999. *In Good Taste: Contemporary Approach to Cooking*. New Jersey: Prentice Hall.
- Labensky, S. and Hause, A. 2006. *On Cooking : A textbook of Culinary Fundamentals. 4th Edition*. New Jersey: Prentice Hall.
- Manask, A.M. and Schechter, M. 2001. *The Complete Guide to Foodservice in Cultural Institution : Keys to Success in Restaurant, Catering, and Special Events*. New York: John Wiley & Sons, Inc.
- Payne-Palacio, J. 2001. *West and Wood's Introduction to Foodservice*. 9th Edition. New Jersey: Prentice Hall.
- Walter, B. 1991. *Herings Dictionary of Classical and Modern Cookery*. Texas: Culinary & Hospitality Industry Publication Service.

### NF20102 FOOD SERVICE ENTREPRENEURSHIP

Basically this course provides exposure on the entrepreneur aspect with the emphasis on the entrepreneurship in food service. In this course, the students are required to prepare a business plan according to the establishment objectives.

#### References

- UiTM Entrepreneurship Study Group. 2005. *Fundamentals of Entrepreneurship*, Revised Edition. USA: Pearson, Prentice Hall.
- MEDEC. 1997. *Keusahawanan*. Malaysia: MEDEC.
- Wade D. 2006. *Successful Restaurant Management*. USA: Thomson Delmar Learning.

### NF20003 EASTERN AND WESTERN COOKERY

These courses give opportunity to the student to become proficient in cooking method of east cookery such as in Asian countries including East and West Asia. Student will learn theory and practically on how to cook European, American and Mediterranean style methods. They also assimilate the theory and practical method in making traditional dessert and bakery.

#### References

- Cullen, N. 2004. *The World of Culinary Supervision, Training, and Management*. 3rd Edition New Jersey: Prentice Hall.
- Minzer D.A. 2001. *Food Preparation for the Professional*. New York: John Wiley & Sons, Inc.
- Nam, I. and Schmidt, A. 1993. *Art of Garnishing*. New York: John Wiley & Sons, Inc.
- The Culinary Institute of America. 2001. *The Professional Chef*. 7th Edition. New York: John Wiley & Sons, Inc.
- Wenzel, W. and Wenzel, G. 1997. *Wenzel's Menu Maker*. New York: John Wiley & Sons, Inc.

### NF20002 MOLECULAR GASTRONOMY

Molecular Gastronomy is a new field of science; it refers to the application of principles of scientific understanding to improve domestic food preparation. Unlike the field of food science that traditionally emphasized more in scale food processing industry, molecular gastronomic connect scientists with the maintenance of food such as those employed in hospitality sector. It will explain the phenomena-phenomena that occur in food while it been cooked in the kitchen. Students will understand the principles of the science behind food preparation and maintenance, including preparation of raw materials, cooking methods and types of food.

#### References

- Barham, P. 2000. *The Science of Cooking*. Springer-Verlag Berlin.
- Lister, T. and Blumenthal, H. 2005. *Kitchen Chemistry*. The Royal Society of Chemistry (UK).
- McGee, H. 2003. *On Food and Cooking. The Science and Lore of the Kitchen*. New York: Scribner.
- This, H. (Translated by Malcolm DeBevoise). 2005. *Molecular gastronomy: Exploring the Science of Flavor*. Columbia University Press.
- Wolke, R.L. 2002. *What Einstein Told His Cook: Kitchen Science Explained*. USA: W & W Norton.

**NF30103 MENU DEVELOPMENT**

This course covers on planning, preparing and developing a menu to suit the organization. Students will be exposed to the menu which are available, standard recipes, its uses and cost calculation. This course will also introduces students to the menu designing.

**References**

- Lendal H. Kotschevar, Diane Withrow. 2007. *Management by Menu, Study Guide, 4th Edition*. USA: Wiley.
- Pau I J. McVety , Bradley J. Ware , Claudette Lévesque Ware.2008. *Fundamentals of Menu Planning*. Wiley; 3rd edition
- Sharon, L. Fullen. 2002. *The Food Service Professionals Guide To: Controlling Restaurant & Food Service Labor costs (The Food Service Professionals Guide, 7)*. Florida: Atlantic Publishing Company (FL).

**NF30303 ARRANGEMENT, DESIGN AND EQUIPMENT FOR FOOD SERVICE**

These courses design to accommodate student with introduction of kitchen premises and its functionality. The student will be trained in planning and developed kitchen that is suitable for certain foodservice institution such as hospital, restaurant and others. Food preparation Safety and Sanitation will be infuse in the courses. Student will able to understand the important of building safety, equipment, energy conservation, the air and water ventilation been used, safety code and HACCP .

**References**

- John C. Birchfield, Raymond T. Sparrowe . 2002. *Design and Layout of Foodservice Facilities*, 2nd edition. USA: John Wiley & Sons.
- Lendal H. Kotschevar, Margaret E. Terrell. 1999. *Foodservice Planning: Layout and Equipment*, 4th edition. USA: Prentice Hall.
- Costas Katsigris, Chris Thomas., 2005. *Design and Equipment for Restaurants and Foodservice: A Management View*, 2nd edition. USA: Wiley.
- Alamanza, B. Kotschevar, L. and Terrell, M. 2000. *Foodservice Planning*. Texas: CHIPS Books.
- Stevens, J. and Scriven, C. 2001. *Manual of Equipment and Design for the Foodservice Industry*. Texas: CHIPS Books.

**NF30012 INDUSTRIAL TRAINING AND SEMINAR**

Each third year student will be placed in selected food industry or research institution to gain experiences suitable to the course program. The training will last for one semester. Students are required to write a report and later present in a seminar. Students will be evaluated by the supervisor of the industry where they attach to, meanwhile, school (lecturers) will also visit the workplace to discuss the performance of students during attachment. The total mark of this course comes from the marks of the industrial supervisor, the visiting lecturer, report and presentation of industrial attachment.

**NF40103 COMMERCIAL FOOD PREPARATION**

This course gives exposure to the students on ways to manage various types of restaurants and food service premises. Students will be taught on how to serve the customers at different type of restaurant setting. Practical will be conducted in a mock restaurant. Besides, the students are taught in the aspect of human and financial management.

**References**

- Elizabeth L awrence Plume.,2001. *The Complete Restaurateur: A Practical Guide to the Craft and Business of Restaurant Ownership*. USA: Wiley.
- Francis T. Lynch. 2007. *The Book of Yields: Accuracy in Food Costing and Purchasing (Plastic Comb)*. USA: Wiley.

**NF40303 FOOD SERVICE SYSTEM AND OPERATION**

The courses give an introduction to students on foodservice system and its operation. They will be acquaint with several type of foodservice operation, the model and components. They will be thought on management aspects especially in human resources and marketing. The practical during these courses will enhance the students the ability to manage, produce and planning a menu while doing it hands on at 'Eksperimental Cafeteria' in School.

**References**

- Akwanza, B., Kotschevar, L., and Terrell, M. 1999. *Foodservice Planning*. Texas: Culinary & Hospitality Industry Publisher Services.
- Birchfield, J.C. and Raymond, C. S 2002. *Design and Layout of Foodservice Facilities*. New York: John Wiley and Sons, Inc.
- Culinary Institute of America. 2002. *The Professional Chef 7th Edition*. New York: John Wiley & Sons, Inc.
- Knight, J. B. and Kotschevar, Lendal. 2000. *Quantity Food Production Planning and Management*. New York: John Wiley & Sons, Inc.
- Mizer, David, A., Porter, M., Sonnier,B. and Eichdrummond, K. 2002. *Food Preparation For The Professional*, 3rd Edition. Texas: Culinary & Hospitality Industry Publication Services.



**NF40102 INTERNATIONAL BUSINESS**

International business introduces students to the concept and diversification component in international business. The topic of globalization, its impact and how it related to the local economy. Students will also be disclosed in the interests of international organizations and international financial policies. Students will be exposed to factors outside of control that affect the international environment and examine the changes that have occurred against the international business arena. This course also helps students to learn social and cultural factors that affect the business carried on around the world.

**References**

- Ball and McCulloch. 2002. *International Business: The Challenge of Global Competition, 8th Edition*. New York: Irwin McGraw-Hill.
- Charles W. Hill. 2008. *International Business, 7th Edition*. USA: McGraw Hill Higher Education.
- John J. Wild, Kenneth L. Wild, 2007. *International Business: The Challenges of Globalization, 4th Edition*. USA: Prentice Hall.
- John Daniels, Lee Radebaugh dan Daniel Sullivan. 2006. *International Business: Environments and Operations, 11th Edition*. USA: Prentice Hall.
- Richard Schaffer, Filiberto Agusti dan Beverly Earle. 2008. *International Business Law and Its Environment, 7th Edition*. USA: South-Western College/West.

**NF00103 RESEARCH PROJECT I**

This course is specifically designed to allow final year students to gain experience in conducting research. Each student is required to take a total of nine credit hours for one research project (throughout two semesters) under the supervision of an academic; three credit hours will be evaluated in this course. Students will pick their research topic from a list of project titles which is given by all academics on the first week of semester. Student are advised to contact their supervisors for detailed information regarding the research that they will be doing, and then determine the agreed work targets. Students are required to present their research proposals before starting laboratory work. This will give students opportunities to get feedback or alternative views about their proposed research, especially regarding study designs and analytical techniques.

**References**

- UMS. 2000. Kaedah Penulisan Tesis/disertasi/latihan ilmiah. Gugusan Sains. Universiti Malaysia Sabah.

**NF40203 QUANTITY FOOD PREPARATION**

This course exposes the students on ways to handle and produce food in bulk quantities. This course is an extension of the previous courses whereby the students will be taught on menu selection, budgeting, purchasing, food preparation and food serving. Students will also have the opportunity to carry out hands-on practical.

**References**

- Harold McGee. 2004. *On Food and Cooking: The Science and Lore of the Kitchen*. Scribner: Rev Upd Edition.
- The Culinary Institute of America. 2004. *Baking and Pastry: Mastering the Art and Craft*. USA: Wiley.
- Sarah R. Labensky, Alan M. Hause, Steven R. Labensky and Pricilla Martel. 2005. *On Cooking: A Textbook of Culinary Fundamentals, 4th Edition*. USA: Prentice Hall.

**NF00206 RESEARCH PROJECT II**

This course is the continuation to NF00103 Research Project I, where students are required to complete their ongoing research project. In this course, students will focus on laboratory analyses and field work. At the end of the project, students will report their findings in the form of a dissertation which will be submitted for examination by two examiners (not including the supervisor) who will be appointed by the course coordinator. All dissertations submitted for examination must adhere to the scientific writing style and standards approved by UMS. Each student will be called to defend his/her dissertation in an oral examination which will be conducted after submission of the dissertation.

**References**

- UMS. 2000. Kaedah penulisan tesis/disertasi/latihan ilmiah. Gugusan Sains. Universiti Malaysia Sabah.

**NF40002 QUANTITY PURCHASING**

The courses introduce student on quantity purchasing aspects. Its emphasize principle and theory in purchasing on large quantity. Whereby, aspect such as specification is important when buyer or purchaser made selection on meat, fish, vegetables, fruits and others. Besides the purchasing method, the student will acquire method of receiving, method of selection and operation cost. They will learned the technology such as computers software that been use in quantity purchasing.

**References**

- Lendal, H. Kotschevar, Richard Donnelly. 1998. *Quantity Food Purchasing* 5th Edition. USA: Prentice Hall.
- Andrew, H. Feinstein, John M. Stefanel. 2001. *Purchasing: Selection and Procurement for the Hospitality Industry*, 5th Edition. USA: Wiley.
- Lynne, Nannen. Robertson. 1994. *Purchasing for Food Service*. Blackwell Publishing Professional; 2nd edition .
- M.C. Warfel, Marion Cremer . 2005. *Purchasing for Food Service Managers*, 5th edition. USA: McCutchan Publishing Corporation.
- Sharon, L. Fullen. 2002. *The Food Service Professionals Guide To: Controlling Restaurant & Food Service Labor costs* (The Food Service Professionals Guide, 7). Florida: Atlantic Publishing Company (FL).