

# **Research Symposium 2017**

**“Initiating Actions for Transformation and Innovations”**

## **Keynote Speech**

**"Facilitating Vocational Technology Education for National Development"**

**Prof. K. K. C. K. Perera**

Dean

Faculty of Engineering, University of Moratuwa

Thursday 30<sup>th</sup> November 2017

University of Vocational Technology

Ratmalana

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## **Vice Chancellor's Message**

It is with immense pleasure that I am issuing a message to the Research Symposium 2017 of the University of Vocational Technology, its second in its brief history. The theme of the University's first Research Symposium was "Transforming TVET from Ideas into Action" and making a further progressive step, the theme this time is "Initiating Actions for Transformation and Innovation", which is of absolute relevance in the present context for TVET in Sri Lanka. Apart from producing graduates, and serving the community, one of the most important tasks expected from a university is creating new knowledge. Despite its short history, it is encouraging to see that the University is fully committed to fulfilling that task as well, conducting research in many a field, as is evidenced in this booklet of research abstracts.

I am particularly happy at this moment as the occasion marks a personal milestone here as the Symposium occurs when I complete exactly one year as the third Vice Chancellor of this University, during which period we were able to introduce innovation into student admission procedures in order to maximize the utilization of resources, double the yearly intake, obtain accreditation from well reputed organizations such as The Institution of Engineers, Sri Lanka (IESL) for its study programmes, and compete and win handsomely in national level competitions, rubbing shoulders with all other national universities of the country. The success of this research symposium would not be possible without the dedication and commitment of all members of the two faculties and enthusiasm shown by the students. I thank them all for their efforts.

I make use of this opportunity to thank the organizers, scholars who reviewed the abstracts as well. I would like to lavishly congratulate the research presenters and wish Research Symposium 2017-University of Vocational Technology a grand success.

Prof. G. L. D. Wickramasinghe  
Vice Chancellor

## **Message from the Symposium Chair**

I am very much pleased to act as Chairman of the second research symposium of the University of Vocational Technology.

The symposium offers staff and students an opportunity to share ideas. Presentations can inspire and being a student or a lecturer we are all committed to lifelong learning. I am proud of the range of topics researched and the quality of the research done. I kindly welcome the key note speaker Professor K.K.CK. Perera, Dean of the Faculty of Engineering of University of Moratuwa for sharing his knowledge and wisdom with us.

All papers to be presented share the goals represented by the theme of this year's symposium, "Initiating Action for Transformation and Innovation." Sri Lanka has a bright future ahead as long as we are successful in taking good ideas and acting on them. This symposium is about good ideas based on strong research techniques combined with a plan for actions.

I strongly believe that the presentations and discussions of this symposium will establish a platform for further development of the vocational and technical education in Sri Lanka.

I am proud to welcome participants to the symposium and commend the efforts of staff and students in making the symposium a success.

Dr. D. D. D. Suraweera  
Dean of the Faculty of Industrial and Vocational Technology  
Symposium Chair

## Contents

<b>A STUDY ON ATTITUDES OF GRADUATE TEACHERS TOWARDS COMPUTER ASSISTED INSTRUCTION IN EASTERN PROVINCE OF SRI LANKA</b>	<b>1</b>
A. M. Jazeel Department of Education and Training Faculty of Training Technology University of Vocational Technology	
<b>A COMPARATIVE EVALUATION OF VARIOUS AUTOMOBILE AIR CONDITIONING REFRIGERANTS: A REVIEW</b>	<b>2</b>
A. M. R. N. Attanayake <sup>1,2*</sup> , R. K. W. H. M. K. Elkaduwe <sup>2,3</sup> University College of Kuliyapitiya <sup>1</sup> Postgraduate Institute of Science, University of Peradeniya <sup>2</sup> Department of Chemical and Process Engineering, Faculty of Engineering, University of Peradeniya <sup>3</sup>	
<b>A STUDY ON CONSTRAINTS IN DEVELOPING ENTREPRENEURSHIP IN ICT UNDERGRADUATES AT THE UNIVERSITY OF VOCATIONAL TECHNOLOGY</b>	<b>3</b>
B. M. T. D. Jayasekara Department of Management Studies Faculty of Training Technology University of Vocational Technology	
<b>INTRODUCING ECO FRIENDLY FLOATING BUILDING CONCEPT FOR SRI LANKAN TOURISM AND HOTEL INDUSTRIES</b>	<b>4</b>
C. K. Dange <sup>1</sup> , R. M. S. Sandaruwan <sup>2</sup> , G. M. S. R. G. Manawadu <sup>3</sup> , Beate Brietwiser <sup>4</sup> Department of Building Services Technology Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>FACTORS CONTRIBUTING TO THE SUCCESSFUL COMPLETION OF BACHELOR OF TECHNOLOGY DEGREE PROGRAMMES BY STUDENTS OF UNIVERSITY OF VOCATIONAL TECHNOLOGY</b>	<b>5</b>
D. D. D. Suraweera Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>DESIGNING AND IMPLEMENTING A DOMESTIC EQUIPMENT USING IMAGE PROCESSING TECHNOLOGY TO MEASURE FLUORIDE IN DRINKING GROUND WATER</b>	<b>6</b>
D. T. Ganegoda Department of Electrical and Electronic Technology Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>CONTROL SYSTEM WITH SELF PRIMING CAPABILITY FOR DOMESTIC WATER PUMP</b>	<b>7</b>
H. A. M. S. Hanchapola <sup>1</sup> , M. M. R. Salgado <sup>2</sup> , J. K. Kanthi <sup>3</sup> , W. C. C. Sumathirathna <sup>4</sup> , Department of Electrical & Electronics <sup>1,2</sup> , Department of Construction <sup>3</sup> , Department of Building Services <sup>4</sup> Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>SENSORY EVALUATION OF THE JAM PRODUCED FROM KARUTHTHAKOLUMBAN MANGO PULP (<i>MANGIFERA INDICA</i>)</b>	<b>8</b>
H. M. T. P. Herath <sup>1</sup> , U. M. Aruna Kumara <sup>1</sup> , <sup>2</sup> K. G. L. R. Jayathunge <sup>2</sup> , *N. Thiruchelvan <sup>1</sup> Department of Post-Harvest Technology, University College of Anuradhapura <sup>1</sup> Institute of Post-harvest Technology, Anuradhapura <sup>2</sup>	

<b>COMMERCIAL CHILLED WATER SYSTEM FOR HIGH RISE BUILDINGS IN COLOMBO CITY AREA</b>	<b>9</b>
I. K.W.R. Gunawardana <sup>1</sup> ; D. M. A. S. Bandara; A. M. R. S. Bandara; Beate Breitwieser <sup>2</sup> Department of Building Services Technology Faculty of Industrial & Vocational Technology University of Vocational Technology	
<b>SENSORY EVALUATION AND ACCEPTABILITY OF NEWLY DEVELOPED CAKE USING JACKFRUIT SEED FLOUR</b>	<b>10</b>
J. I. Ketipe Arachchi, U. M. Aruna Kumara, *N. Thiruchchelvan Department of Post-harvest Technology, University College of Anuradhapura	
<b>ACCEPTABILITY VALUATION OF THE NEWLY DEVELOPED BISCUITS, USING AN UNDERUTILIZED FRUIT YELLOW SAPOTE (<i>POUTERIA CAMPECHINA (KUNTH) BAEHNI</i>)</b>	<b>11</b>
J. M. A. M. Sewwandi <sup>1</sup> , R. M. N. A. Wijewardhana <sup>2</sup> , U. M. Aruna Kumara <sup>1</sup> , N. Thiruchchelvan <sup>1*</sup> Department of Post-Harvest Technology, University College of Anuradhapura <sup>1</sup> Institute of Post-harvest Technology, Anuradhapura <sup>2</sup>	
<b>COMPARISON OF COST, DURABILITY AND QUALITY OF DIFFERENT TYPES OF FORMWORKS IN HIGH RISE BUILDINGS</b>	<b>12</b>
J. M. D. S. D. Jayamanna <sup>1</sup> , T. D. Denagama <sup>2</sup> , W. K. Moramudali, Department of Construction Technology <sup>1,2</sup> Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>ANALYSIS OF MECHANICAL AND METALLURGICAL PROPERTIES OF HARDENED PLAIN CARBON STEEL (PCS) AS A FUNCTION OF DELAYED TIME OF QUENCHING</b>	<b>13</b>
K. G. Alahapperuma <sup>1</sup> , M. D. S. P. Gunathilake <sup>2</sup> Department of Manufacturing Technology Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>SURVEY BASED ANALYSIS ON THE COMPARISON AND SELECTION OF QUENCHED SELF-TEMPERED (QST) STEEL AND COLD TWISTED DEFORMED (CTD) STEEL, IN REINFORCED CONCRETE CONSTRUCTIONS</b>	<b>14</b>
K. G. Alahapperuma <sup>1</sup> , Nadarajah Nandha Kumar <sup>2</sup> Dept. of Manufacturing Technology, Faculty of Industrial & Vocational Technology University of Industrial & Vocational Technology <sup>1</sup> Ashok Steel Company, Ja-ela <sup>2</sup>	
<b>CONCEPTUAL REPRESENTATION OF MONITORING OF FAILURES IN BRIDGES USING IOT SENSOR NODES</b>	<b>15</b>
Kanthi Jayaweera Department of Construction Technology Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>STUDY ON THE SUITABILITY OF LOCAL BANANA VARIETIES IN PREPARATION OF CHIPS</b>	<b>16</b>
M. Thenabadu Department of Agriculture and Food Technology Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>EXPLORATION OF IMPORTANCE OF COMMUNICATION SKILLS ON SUCCESS OF A PROJECT IN THE PERSPECTIVE OF PROJECT MANAGERS</b>	<b>17</b>
Neluwa Liyanage Buddhika Oshadie Department of Management Studies Faculty of Training Technology University of Vocational Technology	

<b>DEVELOPMENT OF A SPICY SAUCE USING LOCAL SPICE (CINNAMON, GARLIC, GINGER, AND TAMARIND)</b>	<b>18</b>
P. I. P. K. Fernando <sup>1</sup> , R. Pitipanaarachchi <sup>2</sup> , U. A. S. K. Edirisinghe <sup>3</sup> , L. D. A. M. Arawwawala <sup>4</sup> Industrial Technology Institute, Research and Development Complex, 503 A, Halbarawa Gardens, Thaladena, Malabe <sup>1,2,4</sup> Department of Agriculture and Food Technology Faculty of Industrial and Vocational Technology, University of Vocational Technology <sup>3</sup>	
<b>HUMAN COMPUTER INTERACTION AND M-LEARNING: AN OVERVIEW OF ENABLING TECHNOLOGIES IN STUDENT CENTERED ENVIRONMENT</b>	<b>19</b>
P. Uruthiran Department of Information and Communication Technology Faculty of Training Technology University of Vocational Technology	
<b>A STUDY ON FEMALE STUDENTS' PARTICIPATION UNDER THE NATIONAL VOCATIONAL FRAMEWORK IN SRI LANKA</b>	<b>20</b>
Padma Shanthi Y. Gamage Department of Education and Training Faculty of Training Technology University of Vocational Technology	
<b>PROFESSIONALIZING THE BELOW-THE-LINE OCCUPATIONS OF THE TELEVISION INDUSTRY - A CASE STUDY IN SRI LANKA</b>	<b>21</b>
R. R. M. D. P. Ratnayake Department of Film and Television Production Technology Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>ARTIFICIAL INTELLIGENCE RELATED REFINEMENTS FOR THE MINIMIZATION OF THE "POTENTIAL OF UNPREDICTABLE DISASTROUS SCENARIOS" - A STUDY AND ANALYSIS</b>	<b>22</b>
Ravindra Koggalage Department of Electrical & Electronics Technology, Faculty of Industrial and Vocational Technology, University of Vocational Technology	
<b>MAINTAINING INDOOR ENVIRONMENT QUALITY IN BUILDINGS: COMPARATIVE STUDY OF GREEN RATING SYSTEMS</b>	<b>23</b>
S. Manawadu Department of Building Services Technology Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>FEASIBILITY STUDY OF INSTALLATION OF 50 KW SOLAR PV SYSTEM AT UNIVERSITY OF VOCATIONAL TECHNOLOGY</b>	<b>24</b>
S. P. A. R. S. Jayathilaka Department of Electrical and Electronic Technology Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>THEORETICAL APPROACH ASBESTOS SHEETS WASTE MANAGEMENT IN SRI LANKA: TRENDS, CHALLENGES AND SOLUTIONS</b>	<b>25</b>
S. Thupeeban <sup>1</sup> , N. Nishanthan <sup>2</sup> , K. Thiruthanigesan <sup>3*</sup> , M. Ramanan <sup>4*</sup> <sup>1</sup> Department of Farm Machinery Technology. <sup>2</sup> Department of Construction Technology <sup>*</sup> Information and Communication Technology Center. University College of Jaffna, University of Vocational Technology	

<b>UNDERGRADUATES' ATTITUDES TOWARDS STUDYING QUANTITATIVE RESEARCH METHODS AND STATISTICS: A SRI LANKAN EXPERIENCE</b>	<b>26</b>
S. A. Liyanage Department of Language Studies Faculty of Training Technology University of Vocational Technology	
<b>INSTRUCTIONAL STRATEGIES OF BLENDED COURSES FOR SELF-PACED LEARNING – AN APPROACH TOWARDS CREATIVITY AND INNOVATION AS EDUCATIONAL OUTCOMES</b>	<b>27</b>
S. A. N. Danushka <sup>1*</sup> , Aruna S. K. Warahena <sup>2</sup> <sup>1</sup> Department of Education and Training, <sup>2</sup> Department of Manufacturing Technology University of Vocational Technology	
<b>THE MODE OF UTILIZATION OF DIGITAL CINEMA PROJECTION FOR SRI LANKA</b>	<b>28</b>
Senesh Dissanaïke Bandara Department of Film and Television Production Technology Faculty of Industrial & Vocational Technology University of Vocational Technology	
<b>EFFECTIVENESS OF USING CAPTIONS IN AN ICT SKILL ENHANCEMENT VIDEO</b>	<b>29</b>
S. G. Nambuwasam Department of Information and Communication Technology Faculty of Training Technology University of Vocational Technology	
<b>PRESENCE OF HARDNESS IN DIETARY INTAKE (WATER) IN CHRONIC KIDNEY DISEASE OF UNKNOWN AETIOLOGY (CKDU) PREVALENT AREAS AND ITS REMOVAL BY NANOFILTRATION</b>	<b>30</b>
T. D. Denagama Department of Construction Technology Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>EFFECTIVENESS OF THE FOUNDATION PROGRAMME FOR NEW INTAKE 2017 OF UNIVERSITY OF VOCATIONAL TECHNOLOGY: STUDY BASED ON BUILDING SERVICES TECHNOLOGY AND CONSTRUCTION TECHNOLOGY AND RESOURCE MANAGEMENT DEGREES</b>	<b>31</b>
T. D. Denagama <sup>1</sup> , G. M. S. R. G. Manawadu <sup>2</sup> , D. T. Ganegoda <sup>3</sup> , W. K. Moramudali <sup>4</sup> <sup>1</sup> Department of Construction Technology, <sup>2</sup> Department of Building Services Technology, <sup>3</sup> Department of Electrical & Electronic Technology, <sup>4</sup> Faculty of Industrial and Vocational Technology, University of Vocational Technology	
<b>PROBLEMS ENCOUNTERED BY WOMEN ENTREPRENEURS IN RATHMALANA DIVISIONAL SECRETARIAT</b>	<b>32</b>
T. R. Vidanapathirane Department of Management Studies Faculty of Training Technology University of Vocational Technology	
<b>COSMETIC PERSPECTIVES OF ETHNO-BOTANY IN NORTHERN PART OF SRI LANKA</b>	<b>33</b>
Thembamala E. N University College of Jaffna	
<b>DEHYDRATION OF OYSTER MUSHROOMS (<i>PLEUROTUS OSTREATUS</i> L.) AND DEVELOPMENT OF VALUE ADDED PRODUCTS</b>	<b>34</b>
U. A. S. K. Edirisinghe Department of Agriculture and Food Technology Faculty of Industrial & Vocational Technology University of Vocational Technology	



<b>ACADEMIC STAFF MOTIVATION AND JOB SATISFACTION IN TECHNICAL COLLEGES IN WESTERN PROVINCE</b>	<b>35</b>
U. Sivachelvy Department of Management Studies Faculty of Training Technology University of Vocational Technology	
<b>WORK-LIFE BALANCE PRACTICES AMONG THE WOMEN EMPLOYEES OF THE SRI LANKAN HOTEL INDUSTRY</b>	<b>36</b>
W. K. Moramudali Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>ENERGY PERFORMANCE ANALYSIS IN AUTO ELECTRICAL SECTION, CEYLON GERMAN TECHNICAL TRAINING INSTITUTE</b>	<b>37</b>
W. A. C. Fernando <sup>1</sup> , Kanthi Jayaweera <sup>2</sup> Department of Electrical and Electronics Technology Faculty of Industrial and Vocational Technology University of Vocational Technology	
<b>EVALUATION OF TRADITIONAL STORAGE PRACTICES TO MANAGE THE BLACK GRAM STORAGE PESTS</b>	<b>38</b>
W. G. S. K. Rathnayake, U. M. Aruna Kumara, N. Thiruchchelvan* Department of Post-Harvest Technology, University College of Anuradhapura	



# **A STUDY ON ATTITUDES OF GRADUATE TEACHERS TOWARDS COMPUTER ASSISTED INSTRUCTION IN EASTERN PROVINCE OF SRI LANKA**

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The technological advancement has offered a plethora of opportunities in educational practices. Pedagogical delivery of lessons in most of the universities in the world has got reshaped and absorbed due to Computer Assisted Instruction (CAI) as a means of the modern learning and teaching process. Nonetheless, most of the teachers in Sri Lanka, if not all, seem to be reluctant to capitalize on this effective instructional strategy of computer assisted instruction instead of the conventional method of teaching. The objectives of this study are to find out the attitudes of the teachers towards computer assisted instruction (CAI) and to test whether significant mean differences exist in sub groups based on gender, subjects studied in degree level, locality of residence, and knowledge of computer. A self-prepared tool of attitude scale was employed and administered among teachers. The comparisons of mean scores were made by using “t” test. The results revealed that the extent of attitude among university teachers is moderate and the selected factors have a differential influence in attitude towards computer assisted instruction.

**Keywords:** Attitudes, Computer Assisted Instruction, Teachers

# A COMPARATIVE EVALUATION OF VARIOUS AUTOMOBILE AIR CONDITIONING REFRIGERANTS: A REVIEW

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Automobile air conditioning (AC) system, once considered a luxurious option has currently become a customarily fitted system in almost all automobiles. It has undergone many changes since it was first invented. Compared to a stationary AC system the automobile AC system is associated with much more complexities. The system requires to possess a compact design enabling it to be fitted into an automobile. Moreover, a certain degree of compatibility is desired as the functions of other systems used alongside are not to be retarded. Hence even the refrigerants utilized in Household AC systems such as R-600a are found to be ill-suited for direct usage in automobiles. The specific gas is found to deal with an undesired level of flammability which imparts a risk when used in automobiles. The refrigerant specifically plays a major role in the system facilitating the heat transfer process. The refrigerants used have been evolving with time giving rise to introduction of novel refrigerants to the market. It is evident from the replacement of the prior used R12 refrigerant with the R-134a in most present day vehicles. The associated environmental effects such as the influence of refrigerants in the ozone layer depletion have given rise to research to overcome them. Furthermore the need to increase the efficiency of the AC system has drawn more attention towards the refrigerants. The research carried out to develop more effective refrigerants stands proof of the fact. Various novel research ideas have been contributing towards the development of effective refrigerants. Nanotechnology based inventions have been emerging in all disciplines due to inherent enhanced properties of nanoparticles such as higher surface to volume ratio, higher reactivity and so on. The involvement of these technologies may lead to a rapid growth in new research ideas to develop an effective refrigerant with minimal environmental effects. Hence it is timely to carry out a comparison of these novel refrigerants with the existing and evaluate each for their suitability.

**Keywords:** Air Conditioning, Automobile, Environment, Refrigerant

# **A STUDY ON CONSTRAINTS IN DEVELOPING ENTREPRENEURSHIP IN ICT UNDERGRADUATES AT THE UNIVERSITY OF VOCATIONAL TECHNOLOGY**

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Encouragements and orientations for youth entrepreneurship in Sri Lanka is insignificant despite the fact that there are lots of opportunities are created specially as a result of advancement of technology. Hence there is gap which Technical and Vocational Education and Training (TVET) sector can fill by engaging in the development of youth for entrepreneurs. University of Vocational Technology (UoVT) is only university to cater to this need in the TVET sector. UoVT is specific as the candidates possess National Vocational Qualifications (NVQ) at the time of entering to the university. Previous local and international research have focused on the constraints in developing entrepreneurial skills of undergraduate students within the traditional education sector. But there are no evidences for previous studies which had been carried out focusing on constraints faced b graduates in entrepreneurship development at UoVT. According to history of ICT Graduates of UoVT, their tendency is to find employment in reputed organizations despite the myriads of opportunities gained by stating up an own business. This behavior is basically due to misconception and poor recognition in society about those who have started their careers as entrepreneurs. Therefore the study focus on constraints faced by undergraduate students of UoVT in starting up an own business. This study analyses problems hindering successful entrepreneurship development among undergraduates of UoVT in ICT fields. Study sample is 30 out of 70 representing third year undergraduate students of weekday ICT degree program. Data is collected through interviews and a structured questionnaire. Statistical techniques and software were used for data analysis. Findings show that most ICT undergraduates have gained adequate theoretical knowledge about entrepreneurship development and how to prepare business plans. However, different constraints are highlighted in the study as barriers to becoming entrepreneurs. There are mainly personal barriers as well as barriers in external environment such as economic, social, technological and environmental.

**Keywords:** Entrepreneurship, Technical and Vocational Education and Training

# INTRODUCING ECO FRIENDLY FLOATING BUILDING CONCEPT FOR SRI LANKAN TOURISM AND HOTEL INDUSTRIES

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There is a rapid growth in tourism and hotel - industry with the enormous inward flow of tourists. Interest of tourism industry has been growing on floating architecture due to many reasons these eco-friendly new customized concepts to the tourism and hotel industry have gained popularity. Further, the concepts of eco-friendly floating buildings are becoming trendy in terms of providing customized services in hotel industry. The objectives of this study are to explore the possibilities of implementing floating hotel facilities and developing building services for floating designs in Sri Lanka. The rules and regulation for the floating buildings were also studied in advance. A pilot survey was conducted for hoteliers to identify the demand for floating building such as floating cabanas and restaurants which can be developed in rivers, tanks and sea in Sri Lanka. Engineers, Architects and other technical persons were surveyed to identify the issues in such constructions. According to findings of pilot survey 80% of hoteliers are interested in implementing this concept. This study revealed that existing technology and labor as positive factors for developing floating hotel structures. However the non – availability of experienced engineering and technological persons is a barrier for the progress in constructing floating buildings.

**Keywords:** Building Services, Ecofriendly Concepts, Floating Building

# **FACTORS CONTRIBUTING TO THE SUCCESSFUL COMPLETION OF BACHELOR OF TECHNOLOGY DEGREE PROGRAMMES BY STUDENTS OF UNIVERSITY OF VOCATIONAL TECHNOLOGY**

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The University of Vocational Technology has been conducting Bachelor of Technology degree programmes since 2010. The first batch of B.Tech students graduated in the year 2014. The number of students registered in 2010 was 225 and out of those only 98 graduated in 2014. Only 44% of them completed and 56% dropped out of their programmes. In 2012, 180 students were registered and only 114, (63%) graduated. The study was conducted to ascertain the factors that facilitate the completion of Bachelor's Degrees by students of University of Vocational Technology and to suggest appropriate suggestions for improvement to enhance students' retention and completion, and to address factors that had led students to dropout. The study revealed that student motivation, their family support, aspirations for further studies and professional development as the main contributing factors for completion of degrees. Institutional support mechanisms also helped them to achieve their target. Students enroll with a definite purpose and high levels of motivation. They need to be advised and guided to achieve their targets. University has to take appropriate actions to maintain this level of motivation. Therefore, systematic scheduling of academic activities and implementing the same as scheduled is of uttermost importance. In addition, research findings indicate the importance of systematic guidance and mentoring systems.

**Keywords:** Dropout, Successful Completion, Motivation

# **DESIGNING AND IMPLEMENTING A DOMESTIC EQUIPMENT USING IMAGE PROCESSING TECHNOLOGY TO MEASURE FLUORIDE IN DRINKING GROUND WATER**

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Dental fluorosis and kidney diseases are common health problems in the dry zone of Sri Lanka because of high fluoride content in drinking ground water. Lack of awareness of people and insufficient facilities to measure the quality of drinking water are the major reasons for these health issues. The objective of this study is to design, implement and evaluate a domestic equipment to measure the fluoride percentage by using image processing technology. Fifty (50) drinking ground water samples of 5ml were selected with various milligrams per liter values ranging from 1mg/l to 25mg/l of fluoride. A reagent (SPADNS) was added in to all samples which were in test tubes. Images were taken by using a digital camera and those images were processed by using MAT Lab software. It was found that there is a relationship between colour intensity and the fluoride content. The color intensity of all the samples were converted to red colour with different intensities. The different color intensities indicated different fluoride levels in samples. After the processing of images of different color intensities fluoride levels were displayed on an LCD display. According to those values the equipment was calibrated using lab tested fluoride contaminated water. Finally, the developed equipment was evaluated with lab tested water samples. This confirmed the lab tested values and equipment results were the same. So it was concluded that the developed equipment was effective for testing fluoride percentages in drinking ground water as domestic equipment.

**Keywords:** Dental Fluorosis, Fluoride Content, Image Processing, SPADNS



# CONTROL SYSTEM WITH SELF PRIMING CAPABILITY FOR DOMESTIC WATER PUMP

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For domestic use in Sri Lanka, water is usually pumped to overhead tank either from a well or from a sump by using a domestic water pump. The basic water pumps are usually manually switched on and off which requires a person's attention. Overflowing and running without water in sump are problems faced by domestic water pump users. To address these issues, many automatic water pump control systems are available in the market. In rural areas the water pumps are installed far away from house. Sometimes the water in the well goes down in dry season. Even though the water level is not below the foot valve, still there can be air bubbles enter into the pipe network through foot valve. This may create few problems in the system. Heating the impeller of the water pump is unavoidable and this situation has an impact on net positive suction head required. If this occurs for longer period, the temperature will rise and internal sliding contact surfaces such as the mechanical seal faces will fail causing damage to pump. It can be determined whether the pump under normal operation or air entrapped, by sensing the temperature of the pump housing closer to impeller. Although there are lots of domestic pump control systems in the market to turn on/off the pumps automatically, still unavailable the facility to reprime water pump...In this design in case of exceeding temperature above set value due to trapped air, the pump can be reprimed automatically. The controller of the pump has been designed using arduino board and sensors. Other advantages of this system are after a repair of pump or footvalve manual repriming is not required.

**Keywords:** Dry Run, Priming, Sensors, Temperature

**SENSORY EVALUATION OF THE JAM PRODUCED FROM  
KARUTHTHAKOLUMBAN MANGO PULP  
(MANGIFERA INDICA)**

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Mango fruit (*Mangifera indica*) is a major fruit crop. There is often high postharvest loss during mango season and huge demand and deficit in off-seasons. Preparing a pulp using mango fruit has the potential to create a product that is both palatable and more easily stored than raw fruit. For this reason, an experiment was conducted with the aim of preparing a mango pulp based jam and then determining its acceptability for people. Mango fruit pulp was prepared hygienically from the collected ripened fruits from the North Central Province of Sri Lanka. Three different samples of mango pulp were used for the jam preparation as three treatments. The first sample was a control sample made from raw mango pulp. The second was called T1 and was made from prepared mango pulp at initial stage and the final sample was called T2 and was made from prepared mango pulp after two months storage in ambient temperature. Then, a sensory evaluation was done using a nine-point hedonic scale sheet and with the input of 30 panelists. Data was analyzed using a Kruskal and Wallis pairwise test with MINITAB Ver. 17. Results revealed that, overall acceptability of T1 ( $p=0.000$ ) and T2 ( $p=0.000$ ) were significantly different from the control and it is for the most part acceptable to the people. As a conclusion, the prepared mango pulp at initial stage and at two-month storage at ambient temperature are acceptable to people. The final product of the mango pulp (T1 and T2) must have physico-chemical analysis during storage time.

**Keywords:** Mango Paste, Jam, Sensory Evaluations

# COMMERCIAL CHILLED WATER SYSTEM FOR HIGH RISE BUILDINGS IN COLOMBO CITY AREA

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The capital of Sri Lanka, Colombo, has experienced a rapid expansion of its urban infrastructure, especially in the area of high-rise buildings, since the end of the Civil War in 2008. 15 % of the population lives in the urban and suburban parts of the city, about 2.3 million inhabitants. A large part of commercial office buildings, hotels, banks and residential buildings are located in the city center and they are relatively close to each other. The cooling loads of these buildings are almost exclusively met by conventional, inefficient, electrically operated air-conditioning systems. These central systems require approximately 75% of the total electricity consumption. The central power supply network is thus subjected to extreme fluctuations in the peak load range; this has a dramatic effect on the price of electricity generated by imported coal. Coal-fired power is not a form of electricity generation that allows for fluctuations in demand so expensive oil power plants have to be switched on during peak load times. This seriously aggravates the efficiency of primary energy utilization during power generation. A sustained reduction of these peak loads could be achieved by a commercial chilled water system with a corresponding pipeline system. The required cooling load performance of the buildings will be covered by appropriate heat exchangers. In combination with cold storage, continuous consumption values could be realized. The study has explored this feasibility and presents the concept of providing central cooling demand with the advantages of space and maintenance cost savings and energy saving in national grid consumption. The benefit of lower investment cost comparing to the costs of individual split units supports the potential of this system.

**Keywords:** Central Cooling Load Generation, Cold Storage, Energy Consumption, Peak Load Range, National Grid Consumption, Primary Energy Utilization

## **SENSORY EVALUATION AND ACCEPTABILITY OF NEWLY DEVELOPED CAKE USING JACKFRUIT SEED FLOUR**

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Jackfruit (*Artocarpus heterophylls*) is commonly grown in home gardens of tropical and subtropical countries as an underutilized fruit crop. Most of the fruits get wasted due to ignorance, lack of post-harvest technology and gaps in supply chain systems. Even though, jackfruit contains significant levels of nutrients and diverse medicinal uses. Jackfruit seed flour is rich in protein and carbohydrate but low fat therefore convert seed in to flour and it can be used to make different convenience food products. Since, this study was conducted to develop nutritionally enriched cake with the jackfruit seed flour supplementation to wheat flour and maize flour. The jackfruit seeds flour was used in different proportion to find out the best composition for preparing cake with wheat flour and maize flour. Three cake samples were prepared such as Jack fruit seed flour and wheat flour (1:1) (T1), jackfruit seed flour and maize flour (1:1) (T2), 100% jack fruit seed flour (T3) and 100% wheat flour as a control (C). After the successful preparation of cakes nine point hedonic scale sensory evaluation were conducted using 30 number of panelist. Collected data were analyzed using a Kruskal-Wallis pairwise test in MINITAB Ver. 17. Results revealed that T1 and T2 slightly significantly different in terms appearance, colour and aroma but in terms of taste, texture as same as control. Overall acceptability of T1 and T2 not significantly different from the control. However T3 not accepted by the people due to the unlike aroma and taste. As a whole 50% jack fruit seed flour supplementation in to a wheat flour or maize flour cake is acceptable limit by the people. However newly prepared jack seed flour based cake need to have a proximate analysis for the nutritional aspects.

**Keywords:** Cake, Jack Fruit, Seed Flour, Sensory Evaluation

**ACCEPTABILITY VALUATION OF THE NEWLY DEVELOPED BISCUITS,  
USING AN UNDERUTILIZED FRUIT YELLOW SAPOTE (*POUTERIA  
CAMPECHINA (KUNTH) BAEHNI*)**

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In Sri Lanka, Yellow sapote fruit (*Pouteria campechina* (Kunth) Baehni) is an underutilized and quite neglected fruit crop. Preparing a biscuit using yellow sapote fruit flour will increase the use of this fruit; as people find the biscuit more palatable than eating the raw fruit. Therefore, an experiment was conducted with the aim of determining the acceptability of the yellow sapote flour based biscuits by people. Dry fruit flour was prepared hygienically from the collected ripened fruits from the North Central Province of Sri Lanka. Six different ratios of Yellow sapote flour (YF) and Rice flour (RF) were used for the biscuit preparation as six treatments, such as Control (0:1), T1 (1:3), T2 (1:2), T3 (1:1), T4 (3:1) and T5 (1:0). Thereafter, a sensory evaluation was done using a nine-point hedonic scale sheet and with the opinions of 30 panelists equally male and female. Gathered data was analyzed using a Kruskal and Wallis pairwise test with MINITAB Ver. 17. T3 (50% YF), T4 (75% YF) and T5 (100% YF) treatments were significantly different from the control (100% RF) of all tested parameters such as appearance, colour, texture, aroma, taste and overall acceptability. Treatment of T2 (33% YF) and control were not significantly different for the appearance, colour, taste and overall acceptability. But aroma and texture of T2 significantly different from the control. T1 (25% YF) compare with control; aroma and taste were not significantly different and other parameters were significantly different from the control. As a conclusion, adding yellow sapote flour up to the 35% mark with rice flour is an acceptable limit for people. The biscuit T2 still need to have a proximate analysis for nutrients such as Crude protein, Crude fat, crude ash, and other. If they are better in both nutrients and are acceptable to people then there is a double advantage as a commercial product in future.

**Keywords:** Biscuits, *Pouteria Campechina*, Sensory, Yellow Sapote

# COMPARISON OF COST, DURABILITY AND QUALITY OF DIFFERENT TYPES OF FORMWORKS IN HIGH RISE BUILDINGS

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High rise buildings are becoming increasingly popular with the rising population, space limitations and advancement of technology. Constructing the main structure of a building involves lot of time, labor and cost. Construction can be accelerated and also can obtain cost advantage by reducing the time and cost of the main structure. Formwork is the most important factor which determines the progress of the project as it impacts to the subsequent activities in projects such as block work, plastering and painting. Conventional formwork and modern conventional formwork is regularly used in the construction industry to form the main structure of a building. Recently, technological transformations have introduced a complete system of formwork that can be built of steel, aluminum and fiberglass to ease the work, and reduce the time and cost of the formwork. However, it is observed that most contractors do not like to shift to such technologies. This research was carried out to identify the different formwork systems that can be used for high rise buildings and to find out the factors affecting selection of a formwork system. Qualitative approach has been selected for this study. Three ongoing sites use different types of formwork systems have been chosen and data was collected by conducting interviews with the Engineers and Site Managers. The cost analysis revealed that Aluminum is the most cost effective formwork. In duration analysis, productivity & expected frequency in Aluminum formwork system is higher than other two types. Quality of the surface is assured in Aluminum & Steel formwork systems than Plywood formwork. Accordingly, findings of this study discovered that Aluminum formwork system is better than steel and modern conventional formwork systems in terms of cost, time and quality. This research will be a roadmap for contractors to select an appropriate formwork system for their high rise construction projects and to disregard false beliefs about Aluminum and Steel formwork systems.

**Keywords:** Construction Industry, Formwork, High Rise Buildings

# **ANALYSIS OF MECHANICAL AND METALLURGICAL PROPERTIES OF HARDENED PLAIN CARBON STEEL (PCS) AS A FUNCTION OF DELAYED TIME OF QUENCHING**

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Hardening is a heat treatment method used to harden PCS, especially medium or high carbon steel. Several variables of the treatment affect the final properties of hardened steel. The time elapsed after taking the austenitic specimen out of the furnace before putting into quenching bath (delayed time) is a major variable that affect the structure and thereby properties. Since even a very few seconds of delayed time variation can cause a huge variation of structure, obtaining expected final properties is a critical issue. So, it is aimed to analyse the mechanical and metallurgical property variation of hardened PCS as a function of delayed time of quenching. A commercially available high carbon steel (1.05% C) will be observed for microstructure and tested for (Vickers) hardness. Ten sets of test specimens, each one for a particular delayed time, will be prepared from the selected steel. Each set consists of three specimens and one test specimen from each set will be specifically prepared and will be micro examined under 500% magnification. The quenched-hardness of all three specimens of each set will be tested and the average value will be calculated. The delayed time will be presented against the approximate percentage of phases (martensite, ferrite and perlite) and the average hardness values. Based on these results, a relationship/pattern will be predicted to find the delayed time of quenching for a particular expected hardness value, enabling to obtain suitable hardness values for the components made from the same steel.

**Keywords:** Delayed Time of Quenching, Mechanical Properties, Metallurgical Properties, Plain Carbon Steel (PCS)

# **SURVEY BASED ANALYSIS ON THE COMPARISON AND SELECTION OF QUENCHED SELF-TEMPERED (QST) STEEL AND COLD TWISTED DEFORMED (CTD) STEEL, IN REINFORCED CONCRETE CONSTRUCTIONS**

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Steel is so vital and common in modern day construction industries. For structures from multiple storied buildings to bridges, dams and sky scrapers, there is no replacement for steel. In most of such structures, steel is used in concretes. In concrete, steel is used as Ribbed Bars (RB) for better grip and bonding with other concrete - materials. Two types of steel ribbed bars are mainly produced in Sri Lanka, namely “Cold Twisted and Deformed (CTD) type steel“ and “Quenched and Self Tempered (QST) type steel”. Both of these categories are produced by using two different production methods complied with SLS 375:2009 standard. According to this SLS standard, there are specifically prescribed ranges of tensile strength and elongation at break, for each one of these two categories of steel. QST and CTD steel market in Sri Lanka is very much confused. Both of these QST and CTD types are easily available in the local market, at a common price range. Because of this situation, most customers tend to use any type of these RB steel arbitrarily, in their constructions, and less attention is paid on the quality requirements of the steel and construction, and other socio-economic and environmental factors. As a step towards resolving this steel market confusion affecting the construction industry, expert survey method based qualitative field investigation has been carried out. So, a survey was done to analyze and demarcate the optimal choice of steel, by distributing a questionnaire and a template to each and every respondent. Respondents were related knowledgeable experts of structural engineers, quantity surveyors, architects, steel manufacturers and hardware stockiest, selected from western province of Sri Lanka. Analysis was done considering four factors related to steel, named as technological factors, economical factors, social and ecological factors. Responds were analyzed by using Analytical Hierarchy Process. The survey results say QST ribbed bars are slightly better in their performance and quality wise than CTD bars. Experimental results taken from mechanical and metallurgical tests and the data given in relevant standard (SLS 375:2009) support this decision. According to the survey results, it can be predicted, even though both types are acceptable to be in good quality, QST category gives the overall better output considering all factors.

**Keywords:** Analytical Hierarchy Process, Cold Twisted and Deformed (CTD) Steel, Customer Satisfaction, Mechanical Properties, Quenched and Self Tempered and Deformed (QST) Steel



# CONCEPTUAL REPRESENTATION OF MONITORING OF FAILURES IN BRIDGES USING IOT SENSOR NODES

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Failure of structures have been analyzed and studied over the years to an extent that enables monitoring systems to accurately predict a failure based on maximum permissible values that have been predetermined based on calculations. This paper is a result of a conceptual study of the application of IoT sensor nodes that have been modified to obtain periodic and/or continuous readings to monitor the health of bridges and detect the point where it becomes hazardous to be in service. The prime objective is to prevent damage to property and save human lives by self-diagnosing potential problems and providing early indication of failure. The system takes readings off a network of Transducers namely, Linear Variable Differential Transducers, Smart Piezoceramic Patches, Laser Doppler Vibrometer with contact sensors etc. and communicates them to a central location for the purpose of analyzing the data to identify alarming conditions. Continuous monitoring helps to avoid disastrous situations and keep mega structures in long term service by attending to maintenance work as and when it is required. Effective usage of modern technologies of IoT for monitoring and reporting the health of structures could play a vital role in minimizing the damage caused by a sudden failure, by providing advance notification. The focus of this paper is on building such a system with currently available technologies.

**Keywords:** Bridge Monitoring, IoT, Transducers

# STUDY ON THE SUITABILITY OF LOCAL BANANA VARIETIES IN PREPARATION OF CHIPS

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Postharvest loss of banana is more than 30% at present in Sri Lanka. Banana can be preserved using various preservation techniques. Preparation of fried chips from banana is one possible preservation technique. This study focused on evaluating the suitability of local banana varieties such as; Ambul, Anamalu, Seenikesel, and Kolikuttu in making chips. Consideration was made of the physical, sensory and quality aspects of prepared banana chips. Fully mature unripe bananas were thinly sliced (2mm), blanched for 3 minutes in 95°C and immersed in 0.1% potassium metabisulphite (KMS) for 15 minutes. Drained banana slices were then dried in a mechanical dryer at 70°C for 1 hr and at 60 °C for 4.5 hrs. Then, banana chips were fried in coconut oil heated to 170 °C and allowed to drain for 20 seconds after which chips were dabbed with tissue paper for 60 sec to remove excess oil. Prepared chips were analyzed for moisture content (%), Protein (%) and Fat content (%) and compared with the same parameters of fresh unripe bananas. The acceptability of chips was assessed organoleptically following a ranking test which used the 5point hedonic scale. The moisture content of unripe banana was found to be 72.2% ,71.2%,73% and 72.5% for Ambul, Anamalu , Seenikesel, and Kolikuttu varieties respectively . Moisture content of 4%, 3.5%, 3.57% and 3.45% was observed for prepared chips using same varieties. Unripe banana had a protein content of 3.12% 3.11%, 2.5% 4.41% for Ambul ,Anamalu, Seenikesel and kolikuttu, varieties respectively. The prepared chips had protein content of 2.89% , 2.9%, 2.4%, 3.49% for the same varieties. Results showed that unripe banana contain 1.19%, 2.25%, 2.15% and 2.65% fat for Ambul, Anamalu, Seenikesel and Kolikuutu varieties respectively. Fat content in fried chips was observed to be 8.89% 7.5%, 8.4% and 7.85 fat content from the same varieties. Anamalu variety has the lowest moisture content both fresh (71.2%,) and when made into chips(3.5%). Highest protein percentage was observed in Kolikuttu variety (3.49%). The banana chips have higher fat content than unripe banana. The higher fat content in fried chips is due to the residual remaining oil after the deep frying. The highest fat absorbance is reported in the Seenikesel variety. The results of sensory evaluation revealed that null hypothesis was rejected for color, flavor, texture and overall acceptability ( $p < 0.05$ ). There is a significant difference in sensory attributes among varieties. According to respondents, chips prepared from the Anamalu variety rated having the best sensory qualities. A microbial analysis was conducted for chips made from the Anamalu variety. The chips were stored at room temperature and analyzed for microbial stability for three months. Presumptive coliform was determined to assess microbial safety. According to the results presumptive coliform was negative which denotes a microbiologically safe product. Further shelf life determination was done by analyzing mold count. The chips exhibited ( $\text{cfu} < 10/\text{g}$ ) for mold during the first three months of storage at ambient temperature. Therefore, it can be concluded that the prepared chips stored at ambient temperature has a shelf life of three months. It is observed that a difference exists in chips developed from different varieties. The Anamalu variety can be concluded to be the organoleptically most suitable for preparation of fried chips.

**Keywords:** Banana Chips, Physical Properties, Sensory Evaluation, Shelf Life

# **EXPLORATION OF IMPORTANCE OF COMMUNICATION SKILLS ON SUCCESS OF A PROJECT IN THE PERSPECTIVE OF PROJECT MANAGERS**

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Stakeholder engagement and communication management are the key elements of project management. Project management dimensions can be mainly divided into two groups' namely hard factors and soft factors. Hard factors are tools and techniques, whereas project communication management is the soft factor. These factors are considered as essential for the successful completion of project goals and outcomes. The research study focuses on identifying importance of communication skills in project management, based on reviews and perspectives obtained from project managers in the different project areas in Sri Lanka. Furthermore it explores how project manager's communication in assisting the development of project communication strategy. It also investigates successful factors of a project communication from the project manager's perspectives and it validates the findings of qualitative research by using a sample of quantitative survey. The qualitative method allowed the understanding and evaluation of project managers' responses about the stakeholder management and relationships .Hence the study has highlighted about the project managers' attitudes and perception about project communication. Accordingly the research reveals that the success of the project depends on identifying and prioritizing stakeholder connections, developing and implementing strategies for engaging and communicating with them. The qualitative data collection for this study is in done through the key informant interview method which, it provides an opportunity to build a strong relationship with ten expert project managers. There are seven themes that emerge from the thematic analysis of transcribed interviews such as knowledge, experience, project requirements, new methods, leadership, public relations, project design and nature of project. The quantitative data collection is done through questionnaire for validation for the seven themes which identified in the qualitative findings. The study concludes as successful projects delivered through effective project communication skills analyzed from the point of view of important themes. The research refers to communication skills that are very essential for making experienced and knowledgeable project managers to implement project successfully.

**Keywords:** Communication Skills, Project Management, Project Managers, Stakeholder Management

## DEVELOPMENT OF A SPICY SAUCE USING LOCAL SPICE (CINNAMON, GARLIC, GINGER, AND TAMARIND)

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Certain foods or food components may provide health and nutritional benefits for human and animals. These foods, known as “functional foods,” are thought to provide benefits beyond basic nutrition and may play a role in reducing or minimizing the risk of certain diseases and other health conditions. Certain amount of population is affect with food allergies, which are having vinegar. This study was aimed to develop a spicy sauce as a taste enhancer, an appetizer, and also having health benefits than as an appetizer for non transmissible diseases. Common local spices such as Tamarind, Ginger, Garlic, and Cinnamon are used to develop a spicy sauce as a functional food. These spices are rich in antioxidant, antimicrobial, Antifungal, anticancer properties, antidiabetic and cholesterol lowering properties, which are proven by many research findings. Two recipes (Formulae 1: consist of, 8% Cinnamon powder, Garlic, Ginger and Tamarind in ratio of 1:1:2 and Formulae 2: consist of 4% Cinnamon powder, Garlic, Ginger and Tamarind in a ratio of 1:1:2) of sauce were prepared by varying the ratio of ingredients and checked for microbial quality (eg. Mould count, *Escherichia coli*, *Salmonella*, Aerobic Plate Count and *Staphylococcus aureus*) and levels of heavy metals [Tin (Sn), Arsenic (As), Cadmium (Cd) and Lead (Pb)] before subjected to a trained panelists (n = 10) and consumer panelists (n = 13) to select the best recipe. It was revealed that microbial quality (Mould count, *E. coli*, *Salmonella* – Not Detected, Aerobic Plate Count and *staphylococcus aureas* – <10 ) and the heavy metals (Sn, As, Cd, Pb: not detected) were in acceptable levels in those 2 recipes. In conclusion, recipe number 1 was selected by the majority of the panelists in terms of acceptance for organoleptic parameters such as Appearance, Colour, Odour, Flavour, Taste, Texture. Further investigation of antioxidant activity of the recipe 1 is in progress.

**Keywords:** Aerobic Plate Count, Free of Synthetic Preservatives, Functional Food, Sauce, Spices

# **HUMAN COMPUTER INTERACTION AND M-LEARNING: AN OVERVIEW OF ENABLING TECHNOLOGIES IN STUDENT CENTERED ENVIRONMENT**

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The popularity and increase of mobile phone usage in Sri Lanka has created an available potential for educators and organizations. The very recent introduction of M-Learning to the higher education sector of the country is set to exploit much of this opportunity, but there remains some reluctance on the readiness of people towards this revolutionary distance learning method. Therefore, it is important to understand the factors that affect students' perceptions of mobile learning. Encouraged by this new trend in learning, this research employs quantitative research methodologies to explore the factors that affect students' intention to use mobile devices for learning. Based on the Unified Theory of Acceptance and Use of Technology (UTAUT), this research formulates the factors, including performance expectancy, effort expectancy, social influence, facilitating conditions, self-efficacy, ubiquity, self-management of learning, attainment value, service quality, and perceived enjoyment, and testable hypotheses that are critical to answer research questions and fulfill research objectives. Additionally, this research examines the differences on intention to use mobile learning across student groups of age, gender, years of using mobile devices, current and prior mobile learning experience and knowledge via comparison analysis. The surveys were administered at five government universities in Sri Lanka. In general, R-value says the magnitude of the correlation coefficient indicates the strength of the association between two variables. The R-value of the study depicts the overall strength of the model. R square value of the study says the explanatory power of the model. In this study, the R square value of the model is 77.1 %. Ten hypotheses were tested in order to investigate relationships between Behavior Intention. M learning in the higher education context was explained by the UTAUT model, which fewer corporates one factor is Performance Expectancy and other nine factors are highly corporate the components of UTAUT.

**Keywords:** Behavior, Intention M-Learning, Mobile Devices, UTAUT Model

# **A STUDY ON FEMALE STUDENTS' PARTICIPATION UNDER THE NATIONAL VOCATIONAL FRAMEWORK IN SRI LANKA**

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This study is an attempt to investigate female students' participation under the National Vocational Qualification (NVQ) Framework in Sri Lanka. The first objective is to look into the present situation of female students' participation in NVQ Levels 1- 4. The second is to understand the key issues relating to female student participation in NVQ. The third is to determine the relationship between technical aptitude and female participation in NVQ, and the fourth is to make recommendations to minimize issues and increase female student participation in National Vocational sphere. Four specific research questions based on the objectives were applied to gather data. The population of the study was selected from the female students undergoing training in NVQ programs of levels 1-4 in the TVET Sector Institutes in Colombo district and their instructors. Sample one consisted of sixty female students who were following NVQ courses. The representative sampling approach is used for study and data was collected accordingly. Sample Two consisted of seven instructors teaching in the TVET organizations from which Sample One was selected. A questionnaire with an aptitude test and the focus group discussion were used for data collection. The quantitative data was analyzed using descriptive statistical methods and qualitative data was analyzed using content analysis. The findings revealed that issues related to the female participation in NVQ at Levels 1- 4 in highly technical fields such as the fields of electrical, electronics and motor mechanics was very limited or none. The pressure of society moreover seemed discouraging and demotivating for girls attempting to enter into technical training related to NVQ. The major conclusion of the research is that there is potential for upgrading the qualifications of girls in highly technical fields at NVQ Levels 1-4. A commitment to enhancing the capacity of the technical aptitude of female students, strategies to increase female students' participation with attractive training opportunities and attempts to generate a positive attitude among female student as well as the community were suggested.

**Keywords:** Female Participation, Technical Aptitude, Technical Education

# **PROFESSIONALIZING THE BELOW-THE-LINE OCCUPATIONS OF THE TELEVISION INDUSTRY - A CASE STUDY IN SRI LANKA**

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It needs to be recognized that the television industry is an important industrial sector with vast potential for growing and as a major player in the Creative Industry. The organizational structure, extension, legal and policy manners and economic contribution of the television industry are all key considerations in this study. The study looks at the diverse and non-formal ideas of different individuals and groups related to the television field in Sri Lanka. The research problem is how do we realize the concept of professionalization among the people belonging to the below the line occupational fields of contemporary Sri Lankan television industry by benchmarking global standards. The methodology used in this study is a mixed one of qualitative and quantitative methods and the study is based on the population of three (03) occupational areas in the television industry; Video Camera operations, Lighting and Post-Production. Research data was collected through interviews with experts of the industry and through a questionnaire focused on the convenient sample based on population. Findings collected through the questionnaire were analyzed by benchmarking the theoretical background and the facts extracted from the interviews held with experts. The study concluded that the technical personnel working in the field of television in Sri Lanka are fulfilling their educational qualifications satisfactorily. Majority of those personnel have completed a vocational training programme. On the other hand, majority of personnel are working without getting a membership in a guild or in a professional body. Even the personnel who have a membership in a guild do not have a clear idea about the role of a guild. Those who do not have a membership in a professional association or a trade union are interested in getting such a membership. Most of the television channels provide educational and training opportunities to their employees. There are, however, some issues noticed such as expecting over time work and multiple skills from a single person.

**Keywords:** Below- the - Line Occupations, Creative Industry, Professionalization, Television Industry

# **ARTIFICIAL INTELLIGENCE RELATED REFINEMENTS FOR THE MINIMIZATION OF THE “POTENTIAL OF UNPREDICTABLE DISASTROUS SCENARIOS” - A STUDY AND ANALYSIS**

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Artificial Intelligence (AI) is to combine human way of thinking into machines to follow intelligent-decision based actions. With the latest technological advancements, AI has received increased attention in recent years. Modern day applications of AI leads to vast range of benefits including high reliability in medical procedures, increase productivity and boost the economy in agriculture and industry, and in overall to improve the quality of life of the people including differently abled and elderly. The AI applications’ potential is so peculiar that the usage turning from good to bad is just a twist. Even though AI led technological developments contribute for human benefits, there could be chances for disastrous consequences in some cases and situations. Examples can be seen in numerous fields such as medical, agriculture, environmental, and high tech industries including manufacturing and services where humans and AI based technologies are heavily interacted. Artificial intelligence needs directional inputs including data and logics for its functionality. In such applications, due misleading data and logic complications, the possibility of misbehaving is still a risk in using AI. This research is primarily for the improvement of minimizing such negative aspects of AI. The possibilities of directing AI applications for technological developments to reduce disastrous consequences, is being studied and analyzed in this research. This study shows that the AI and other latest technologies if incorporated with “Study and concepts shown by other philosophers and great thinkers” would bring effective research outcomes. The research and analysis will cover several key applications in the above mentioned fields.

**Keywords:** Artificial Intelligence, Disaster, Happiness, Technology



# MAINTAINING INDOOR ENVIRONMENT QUALITY IN BUILDINGS: COMPARATIVE STUDY OF GREEN RATING SYSTEMS

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Indoor Environmental Quality (IEQ) plays a major role in considering occupants' health and wellbeing. Policies, strategies and guidelines for achieving the required IEQ have been developed in order to maintain an acceptable IEQ. Control and evaluation of indoor air factors, lighting, thermal comfort and acoustic are needed for ensuring sufficient environmental quality. The impact of emissions from building materials, furnishings and HVAC systems, maintaining lighting levels, acoustic parameters and thermal comfort to indoor environment quality should be included in the assessment of indoor environmental quality. IEQ is considered as an essential parameter in sustainability assessment of buildings. The purpose of this research is to improve and enhance the indoor environmental quality parameters in Green<sup>(SL)</sup> rating tool version 1.0 published by the Green Building Council of Sri Lanka (GBCSL). The Green rating tool from GBCSL are sustainable development tools produced for the local context. Improving and enhancing such systems are becoming necessary in the developing world because of the considerable environmental, social and economic problems they face In Sri Lanka. Green rating tool was developed and published in 2010 and it has not been improved during the past seven years. Therefore, a comparative study is needed to find out the present Indoor Environmental Quality parameters and the suitability of those parameters in a local context. Therefore, this research studied international green building assessment tools such as LEED, CASBEE, BREEAM, Green Star, Green Mark, LEED India, Sri Lankan government institution guidelines and other well-known systems for assessment of indoor environmental quality.

**Keywords:** Green<sup>(SL)</sup> Version 1.0, Indoor Environment, Sustainability Assessment

# **FEASIBILITY STUDY OF INSTALLATION OF 50 KW SOLAR PV SYSTEM AT UNIVERSITY OF VOCATIONAL TECHNOLOGY**

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Renewable energy resources are becoming popular and today the use of it is increasing. An example of a clean renewable energy source is, the energy generated using photovoltaic (PV) systems. PV systems are widely used as a renewable energy source. Components of PV systems, such as inverters, have become widely used and in order to harness maximum power from a PV system, and for this purpose different methods are being used. This paper presents the concept of designing a PV system with focusing on sizing or arrays, charge controller ratings, inverter ratings and many other components for a specific load. Matching the power consumption level with the supply level can make a great difference in the efficiencies of power utilization. This research is mainly based on the preliminary feasibility study which will look at the key considerations needing to be addressed when installing a solar PV array at the New Building of the University of Vocational Technology and whether the proposed array(s) will be roof-top mounted or building integrated. Designed PV system should be able to generate up to 50 kW of power from a solar PV system. Design an off-grid PV system with reduced cost and maintaining sustainability is the challenge in this research.

**Keywords:** Charge Regulator Ratings, Inverter Ratings Energy Management Plan, Photovoltaic System, Renewable Energy Resource, Sizing of Arrays

# THEORETICAL APPROACH ASBESTOS SHEETS WASTE MANAGEMENT IN SRI LANKA: TRENDS, CHALLENGES AND SOLUTIONS

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During past several decades, asbestos containing products (ACP) have been used, and asbestos waste generated, in more quantities. In 2008, Sri Lanka started banning production and use of ACP, although still 80% asbestos roofing sheet present in private and public buildings. According to the parliament (Act no 534/18 February 2008) cabinet also approved a proposal to prepare an operational programs to prohibit asbestos related productions within 2024. The Scope of research is trends and challenges of Asbestos containing waste (ACW) management without affecting environment. The waste (ACW) is significant exposure causes of deadly diseases including fibrosis and cancer of the lung, mesothelioma, laryngeal cancers and pulmonary fibrosis. Many scientific research papers proposed physical, chemical, and biological treatments aimed to the detoxification of ACW. This Paper is specifically deliberate to be used as a basis for the development of policies for asbestos waste management, find substitutes for asbestos, raise public awareness, medical facilities for asbestos affected communities and for investments in new waste treatment facilities, for decision makers at all levels of government and in private industries in Sri Lanka by using SWOT (Strength Weakness opportunity threads) method analysis. Data analysis is derived from different channels including governmental reports and articles, waste management related regulations, literature review, and focus group meetings to make Strategies and policies for successful ACW pilot program through SWOT analysis. According to that the suitable mechanism is conveying as a detoxified construction material (as a cement) to recycle ACW with minimal environmental effect in Sri Lanka.

**Keywords:** Asbestos Sheets, Asbestos Containing Waste, Waste Management, Sri Lanka

# **UNDERGRADUATES' ATTITUDES TOWARDS STUDYING QUANTITATIVE RESEARCH METHODS AND STATISTICS: A SRI LANKAN EXPERIENCE**

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The study was to investigate factors that form different attitudes towards studying Research Methods and Statistics as a supportive module to core modules in the curricula of degree programmes. Different contextual realities cause students to have varying attitudes towards the main hypothesis: undergraduates' educational background influences their attitudes on studying Research Methods and Statistics. Therefore, this research focuses on students' educational background and knowledge in English language, and whether such factors have any influence on students' varying attitudes towards learning Research Methods and Statistics. From among the population of 200 students who had offered the relevant module, a sample of 48 students were selected. A Likert scale questionnaire, Attitude toward Research Scale (ATRS), was the main instrument that was administered to gather data. Students who had better results in Science and Mathematics and those who have better English Language knowledge, based on their GCE AL and OL results, showed more positive attitudes for studying Research Methods and Statistics as a learning module in their degree programmes. Based on the findings, it could be recommended that more emphasis should be given to equip students with science and mathematics knowledge and English language skills especially during the first year which enables developing the potential to engage in research work and produce the research outcomes expected in the final year.

**Keywords:** Attitudes, Undergraduates, Educational Background, Research Methods

# INSTRUCTIONAL STRATEGIES OF BLENDED COURSES FOR SELF-PACED LEARNING – AN APPROACH TOWARDS CREATIVITY AND INNOVATION AS EDUCATIONAL OUTCOMES

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The “potential for the knowledge and wisdom” the human possess is the key to the evolvement of human societies. Phenomenally, experienced & realized knowledge has the potential or the power to generate new ideas, imaginations, initiations, and innovations (4I). Thinking of the contrast, if no effective and useful 4I is really visible out from any learning process, such learning would primarily be a “superficial awareness” or “just a memory of words with no reality”. And, in the designing and conducting of courses and modules, instructional strategies play a primary role in assuring the student experiencing & realizing the knowledge during the learning process, and moving towards 4I and innovations. In both of the two major learning processes namely “self-paced or distant learning or online learning” and “classroom learning”, it is important to get surfaced 4I into live, since 4I is a strong indicator of “experienced & realized knowledge”. As creating the cause to achieve 4I, both “Self-paced” and “Class room learning” are truly to be in a self-absorbable-pace in nature. In achieving this, the blending of both the methods of “classroom learning” and “self-paced or distant learning or online learning” would be more important. True to the above, “Blended Learning” has become the recent development in the field of education. Blended Learning, as implied above, refers a combination of “face to face” and online learning. In the blended learning process, for gaining knowledge beyond the memory of words, and assuring the student experience and realize the knowledge, instructional strategies play crucial role. Inquiry-based, Case-based and Problem-based are the three predominant instructional strategies, used for self-paced learners. This particular study was conducted with four research objectives namely “ 1: To identify the best instructional strategies for the blended courses for self-paced learners”, “2: To decide the appropriate instructional design guidelines in designing learning activities for self-paced learners”, “3: To establish the effective instructional strategies to promote learner satisfaction and perceived learning of self-paced learners” and “4: To decide the appropriate instructional strategies which support for best learning achievements of self-paced learners”. As this enquiry revealed, Bloom’s Taxonomy of Educational Objectives, Gagne’s nine events of instruction, Merrill’s first principles of instruction and John Keller’s Motivational model (ARCS Model) have been used as instructional design guidelines to design learning activities for the self-paced learning in blended learning courses to motivate the self-paced learning. In Sri Lankan context, Case-based instructional strategy is used in 4.4%. Problem-based instructional strategy is used in 4.4% and Inquiry-based instructional strategy is used in 82% in Blended Learning platforms. The height learner satisfaction and motivation draws by Inquiry-based instructional Strategy.

**Keywords:** Blended Learning, Instructional Design Guidelines, 4I, Self-paced Learning, Inquiry-Based Instructional Strategy, Case-Based Instructional Strategy, Problem-Based Instructional Strategy, Creativity and Innovation, Education

# THE MODE OF UTILIZATION OF DIGITAL CINEMA PROJECTION FOR SRI LANKA

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Digital Cinema Projection refers to system of exhibiting feature films in cinema theaters while meeting the global standards of DCI-compliant (Digital Cinema Initiatives, LLC). DCI-compliant quality uses a digital projector with the capacity of screening 2K resolution (images with pixel resolution of 2048 horizontal and 1080 vertical or 2.2Megapixel at 24 frames per second) as the minimum and with the optimum being 4K. As worldwide, there is a discontinuation of the production of 35mm film stocks, Digital Cinema Projection is globally compulsory. Therefore, Sri Lanka is required to identify a Mode of Utilization of Digital Cinema Projection for the survival of its Local and National Cinema. Sri Lanka had a decent number of 365 cinema theaters for Local and National Cinema in the 1970s, but that number has decreased to 133 (36.5%) by the end of 2015 according to a survey by the National Film Corporation of Sri Lanka. With the reduction of the number and quality of cinema theaters, the film audience shifted to use new technologies to watch movies at home. Therefore the practice of Film Viewing in cinema theaters also is declining to as low as 5% of the population. After decades of indecision, Digital Cinema Projection is now being investigated by stakeholders of Sri Lankan Film Industry with aggregate pressure to convert all the cinema theaters to Digital Cinema Projection. Though Digital Cinema Projection is globally standardized, the Mode of Utilization varies from country to country based on two underpinning concepts. The first is on the basis of market power and technological implementation. The second is audience development and open access. To identify the Mode of Utilization of Digital Cinema Projection for Sri Lanka, the research study used a combination of the research methods such as the questionnaire survey method and the interview survey method rather than deciding and depending on single method. As per the results of the research study, the implications indicated benefits expected to accrue to filmmakers, film distributors, film exhibitors and the film audience as the stakeholders by following these recommendations. First, the Mode of Utilization of Digital Cinema Projection in Sri Lanka has to be compliant with DCI-Initiatives Standards, since it is an upgradable platform for further developments in due course for a developing country. Second, films would be supplied to the theatre as a digital file called a Digital Cinema Package (DCP), which would enhance the quality of viewing experience. Third, the Mode of Utilization of DCI-compliant Digital Cinema Package is aligned with the safety of the copyright of the work of art, so the intellectual property law would be secured. And fourth, the Mode of Utilization of Digital Cinema distribution has proven the potentiality of saving of capital in the film industry by reducing the amount of capital and encouraged the investors for film trade.

**Keywords:** DCI-Initiatives, Digital Cinema Projection, Sri Lankan Film Industry, Viewing Experience

# **EFFECTIVENESS OF USING CAPTIONS IN AN ICT SKILL ENHANCEMENT VIDEO**

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Sri Lanka is a multinational multi lingual country. Majority of Sri Lankans use Sinhala which is a non-international language for communication purposes. English is used as an international language and also is used as the language to communicate with other nationalities of Sri Lanka. Hence higher educational courses and professional development courses are delivered using English as the medium of instruction. The major objective of the study was to examine the effectiveness of incorporating captions in an educational video developed to enhance ICT skills of Sri Lankan youth. The research was done using the quantitative analysis. The sample was selected using the simple random sampling technique. Twenty ICT literate Sri Lankan youth took part in the study. The sample was divided into two groups. The experimental group was allowed to watch the video clip with captions on while the control group was allowed to watch the video clip without captions (captions deleted). In the video clip both narrations and captions were provided in English. Synchronized, equivalent and accessible captions were used in the video clip. Both groups were asked to watch the given video clip carefully to understand the content provided in it. After showing the video clip, both groups had their feedback collected on the shown video clip through a questionnaire. According to the collected feedback the experimental group could understand the content of the video clip much better and they could more successfully answer the questions given in the questionnaire compared to the control group.

**Keywords:** Captions, Videos

# **PRESENCE OF HARDNESS IN DIETARY INTAKE (WATER) IN CHRONIC KIDNEY DISEASE OF UNKNOWN AETIOLOGY (CKDu) PREVALENT AREAS AND ITS REMOVAL BY NANOFILTRATION**

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Chronic Kidney Disease of unknown aetiology (CKDu), a major epidemic disease spreading over the North Central Province in Sri Lanka, is known as a multi-factorial disease. Among the various factors, excessive levels of hardness present in water have been considered as one of the main causes of CKDu. Therefore, nanofiltration units are being introduced to the CKDu affected areas with the intention of providing good quality water. This study focused at investigating the efficiency of nanofiltration units for removal of hardness in water. Synthetic water samples were prepared simulating the existing water quality in the selected CKDu prevalent areas and filtered through the nanofilter. The filtered water samples were analysed for hardness. Results showed that the nanofilter could effectively remove lower concentrations of hardness. However, removal of hardness by the nanofilter showed a rapid decrease at higher concentrations of hardness. The nanofiltration unit may not be able to use in the CKDu prevalent areas due to its lower capacity demonstrated for removing excessive hardness levels present in the raw water.

**Keywords:** CKDu, Hardness, Nanofiltration



# **EFFECTIVENESS OF THE FOUNDATION PROGRAMME FOR NEW INTAKE 2017 OF UNIVERSITY OF VOCATIONAL TECHNOLOGY: STUDY BASED ON BUILDING SERVICES TECHNOLOGY AND CONSTRUCTION TECHNOLOGY AND RESOURCE MANAGEMENT DEGREES**

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The objective of the University of Vocational Technology is to produce vocationally qualified individuals to fulfill the skill mismatch between the educational and the industrial requirements. Along with the vocationalisation of Advanced level stream, The University of Vocational Technology extended students entry from its previous National Vocational Qualification only to GCE. Advanced Level qualifications from 2017. A three-month foundation programme was introduced to fill the gap between Advance Level Students and National Vocational Qualification students with new intakes. The purpose of this study was to identify the above gap and assess the effectiveness of the specially designed and implemented foundation programme for gap filling. A survey instrument was administered among seventy five students of Construction Technology and Resource Management and Building Services Technology programmes. Key findings of this study indicated that two foundation programmes are found to be successful, but further improvements are needed as suggested. It was also found that Advance Level Students are lacking industry exposure compared those who have National Vocational Qualification Level V qualification. In order to overcome this barrier separate industrial exposure programme can be implemented for the Advance Level students after the entry.

**Keywords:** Advance Level, Gap Filling, NVQ, Vocational

## **PROBLEMS ENCOUNTERED BY WOMEN ENTREPRENEURS IN RATHMALANA DIVISIONAL SECRETARIAT**

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The Small and Medium Enterprise (SME) sector has been booming in Sri Lanka in recent years. In the emerging SME sector, the contribution of the women entrepreneurs is dramatically increasing. This has occurred because the cost of living has been rapidly increasing within the country. The intention of most women entrepreneurs is to support their dependents and supplement other bread winners. This resulting empowerment of women and economic development which is a remarkable occurrence in a developing country. A woman earning her own livelihood results reduces the pressure of unemployment. Therefore women entrepreneurs need to be encouraged and facilitated. Accordingly, this study set out to investigate the problems and challenges faced by women entrepreneurs in carrying out their business. The qualitative and quantitative methods were employed for the study using self-developed questionnaires. A sample of 40 women entrepreneurs were selected in Rathmalana –South using the simple random sampling method. The list of women entrepreneurs were drawn from the records of the Divisional Secretariat Office, Rathmalana . The results indicated that most women entrepreneurs had difficulties in finding initial capital for their enterprise due to the rigid rules in obtaining loans from banks. Also the findings revealed that they highly depend on informal money lenders who charge very high interest rates. Findings confirmed that the gender discrimination is inevitable and that has become a significant barrier when handling day to day business functions as a woman. Further the findings highlighted that the survival of their enterprises are uncertain due to poor recognition for their products and lack of re- investment for expansion. The increasing cost and undefined quality of materials and lack of methods to purchase raw materials on a credit basis are the most critical challenges they had to face as per findings. The Study proposed some viable solutions for the problems and challenges identified.

**Keywords:** Economic Development, SME Sector, Women Empowerment, Women Entrepreneurship

# **COSMETIC PERSPECTIVES OF ETHNO-BOTANY IN NORTHERN PART OF SRI LANKA**

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Local women in Northern Sri Lankan communities are much interested in using indigenous herbs as cosmetics for many years. An ethno-botanical survey has been conducted with the objective of identifying the cosmetic use of indigenous plants in Northern part of Sri Lanka. The data was collected from 160 female informants from five districts using questionnaire method and semi structured interviews. A total of 36 plant species belonging to 16 families were identified for the purpose of beautifying skin, hair and nail. Indigenous plants used for cosmetic purposes include fairness (16.6 %), wrinkle (16.6%), acne and spots (13.8%), nourishment (8.3%), hair growth (11.1%), hair tonic (13.8%), nail care (11.1%) lip and eye care (8.3%). Forty different traditional cosmetic recipes using different herbal parts were identified. The present study regarding the traditional knowledge and practice of cosmetic herbs contributes to preserve the unnoticed aspect of cosmetic ethno-botany in Sri Lanka.

**Keywords:** Cosmetics, Ethno-botany, Northern Sri Lanka, Traditional

# DEHYDRATION OF OYSTER MUSHROOMS (*PLEUROTUSOSTREATUS L.*) AND DEVELOPMENT OF VALUE ADDED PRODUCTS

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Mushrooms are perishable, nutritive and medicinally valuable vegetables for consumers with specific tastes. Although hundreds of edible mushrooms species exist less than ten species are commercially cultivated in any significant quantity. In the last two decades Oyster mushrooms (*Pleurotostreatus*) have spread throughout the country with small scale operations introducing new cultivation technologies. Production has been estimated at around 500 tons per annum by small scale growers in Sri Lanka. Quality parameters for keeping mushrooms have changed rapidly and now they are kept a maximum of 72 hours under refrigeration (less than 10<sup>0</sup>C). The purpose of this study was to minimize spoilage and maintain good quality mushroom product by using dehydration technique with optimum temperature level for growers. This will lead to the introduction of value added products for consumers. Two different blanching methods (Hot water and steam), soaking methods, and dehydration methods were applied. Proximate analysis, microbial and microbial analysis and sensory analysis were done before and after dehydration. Both hot water and steam blanching were not suitable for consumption due to black colour. Applicable soaking methods were also not suitable due to black colour pigments. Average number of colony forming unit for bacteria and fungi of fresh mushroom were reported as 4 and 400 at 0.001 dilutions respectively. These colonies were indicated as 1 and 200 at 0.001 for sundried one. But both bacteria and fungi were not reported from mechanical dried mushroom. Under proximate analysis of fresh mushroom was reported as 88% moisture, 4% of protein, 0.6% fat, 1.2% of fiber and 1% ash. Protein content of dried mushrooms in both techniques is given high content (15.9%), equal to 4 times than the fresh one and other constituents were not significant changed. The suitable temperature and time period for dehydration of Oyster was 60<sup>0</sup>C for 10-12 hours in oven drying method. In the case of the direct sun drying method they need to be exposed 8 hours on sunny days and until moisture content was maintained in the range of 14-15%. A dehydration curve shows the highest rate of removal of moisture was at the beginning (first thirty minutes). It was examined that the sensory and overall quality attributors are better in products from oven drying method than products from sun dried methods.

**Keywords:** Blanching, Oven Drying, Sun Drying, Value Added Product

# ACADEMIC STAFF MOTIVATION AND JOB SATISFACTION IN TECHNICAL COLLEGES IN WESTERN PROVINCE

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This research study is aimed at investigating the job satisfaction of academic staff in the Technical Colleges in Western Province. The study focused on Technical Colleges in Western Province and the literature review is also related to motivation and job satisfaction. The specific objectives of the research study were to evaluate the motivation and job satisfaction to compare the evaluated motivation and evaluated job satisfaction, to identify the relationship between motivation and job satisfaction of the academic staff in the Technical Colleges, to identify the problems of academic staff of the Technical Colleges and to give recommendations to mainly the problems of academic staff in the Technical Colleges. The study was designed as a descriptive correlation research. 120 samples were randomly selected for the study. Sample included 120 academic staff members. Data were collected using questionnaire and interviews. Pearson's correlation coefficient and regression analysis were done using SPSS software to identify relationships among variables. Financial Incentives and Non-financial Incentives were considered as the independent variables while Job satisfaction of the academic staff was considered as the dependent variable. According to the results of the research study, when considering the independent variables, financial incentives strongly affect the job satisfaction of the academic staff and also the non-financial incentives of the academic staff very strongly influence on job satisfaction of the academic staff in the Technical Colleges. As recommendations, more independent variables, sample size and different type of analysis method for future research study can be suggested.

**Keywords:** Incentives, Motivation and Satisfaction

# **WORK-LIFE BALANCE PRACTICES AMONG THE WOMEN EMPLOYEES OF THE SRI LANKAN HOTEL INDUSTRY**

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Work-life balance has been a huge challenge for female hotel employees. As a result, female labor participation in the hotel sector is still at a low rate. Previous research has studied the reasons for low women participation in hotels. However, work-life balance practices have not been researched in the Sri Lankan context. Work-life balance practices can be categorized as organizational practices and family practices. The purpose of this study is to explore the work-life balance practices that are being adopted by the female employees in the hotel industry. This research study aims to investigate both the organizational and family practices available for female hotel employees to be successful in their career and personal life. Qualitative approach was employed in this study. Five in-depth interviews were conducted with female hotel employees in order to identify their views upon the work-life balance practices initiated by the employer and support given by the family. Findings of this study indicate that both organizational and family work-life balance practices are equally important to increase subjective job-satisfaction. Women who are working in hotels where they implement supportive work-life balance practices such as supervisor support, flexible hours, opportunities for growth and daycare facilities have positive impact on work. Family support in terms of childcare, understanding and parents' support were considered as important family practices. This study however has not focused on the inputs of hotel managers' perspective on the topic. Future research can be done to explore long-term societal practices that can be implemented to change the negative image of women in hotels.

**Keywords:** Hotel Industry, Job Satisfaction, Women, Work-life Balance

# **ENERGY PERFORMANCE ANALYSIS IN AUTO ELECTRICAL SECTION, CEYLON GERMAN TECHNICAL TRAINING INSTITUTE**

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The Auto Electrical Section (AES) is one of the leading sections of Ceylon German Technical Training Institute in Sri Lanka. It is installed with a number of equipment and machines for training purposes. Scheduled training programmes are conducted to train around 470 students per year. As the main energy sources, electrical energy is used for fans, lighting, computers, air-conditioners, variable power supply units, training panels, battery charger, soldering irons, multimedia and audio system. Gasoline is used for engines which required for conducting the practical training sessions. AES is fed by the electricity taken from the national grid. In case of power failures, a diesel generator is used as a stand-by electricity supply. Monthly electricity consumption of AES is in the 8.61% of the average monthly electricity consumption of the main building. The energy balance of the AES is calculated on collected data and the logged data during the survey based process. Collect preliminary data on energy consumption of all equipment and machines that use for training process. Analyze the recorded data and calculate the power consumption. AES has a mini PV panel and generated electricity is used for the garden illumination in the night time. This study was performed to identify the Energy Management Opportunities and subsequently to give the recommendations for the conservation. There is no sub-metering system at the facility rather than CEB kWh meter. Having a Sub-metering system will be beneficial to set energy targets and monitor the performance to achieve goals. Therefore, it is recommended to install a sub-metering system after identifying appropriate sub-sections. Average energy consumption per student was analyzed and compared against the predicted situation with the implementation of recommendations.

**Keywords:** Conservation, Energy, Electricity, Management

## EVALUATION OF TRADITIONAL STORAGE PRACTICES TO MANAGE THE BLACK GRAM STORAGE PESTS

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Black gram (*Vigna mungo*) is an important pulse crop in Sri Lanka and rich source of protein. Even though black gram is damaged by the several pests and diseases; especially, storage pests are the serious damaging pests on storage. Synthetic chemical for the storage pests control is costly and causing residual effect to the environment. Further, in Sri Lanka pulse storage is practiced as a small scale or household level. So, using traditional methods are utmost appropriate for the storage pests management. Therefore, a research study was conducted using traditional storage practices to control storage pests of black gram. Three set of experiments were conducted. Experiment 01, Black gram storage with different types leaves such as *Azadirachta indica* (neem), *Vitex nigundo* (nika), *Citrus macroptera* (citrus), *Ocimum teniflorum* (thulsi) leaves. Experiment 02 was done using ash from different sources (cow dung, paddy husk, neem wood, *Strychnos nux-vomica* (kaduru) wood ash) mixed with black gram. Another experiment was arranged with black gram mixed with sea sand, dried chili, coconut oil and camphor all the experiments set up with a non-treated control. After the 3 months of time; total live pests (LP), death pests (DP) and damaged grains (DG) were recorded. Results revealed that, all the leaves treatment significantly different from the non-treated control, among that neem leaves shown significant effect against pest (DG  $2.2 \pm 0.5$ ), (LP  $1.5 \pm 0.577$ ) & (DP  $0.7 \pm 0.957$ ) but in non-treated control (NTC) LP, DP and DG were  $287.3 \pm 12.05$ ,  $59.3 \pm 2.68$  and  $345.5 \pm 13.84$  respectively. All the ashes significantly different from the non-treated control, among that Kaduru wood ash yielded the maximum control of pest (LP  $9 \pm 1.55$ ), (DG  $41 \pm 7.65$ ) and NTC shown LP  $444 \pm 22.3$  & DG  $567 \pm 29.1$ . Another experiment, Coconut oil completely prohibited the pest damage and camphor yielded  $2.5 \pm 1$  LP,  $0.0$  DP and  $2.5 \pm 0.577$  DG. But in NTC shown LP  $322.8 \pm 10.66$ , DP  $85 \pm 12.44$  and DG  $411.5 \pm 11.53$ . Black gram storage pest significantly can manage by adding neem leaves and camphor and mixing with Kaduru ash. However, coating of black gram with coconut oil is a best control method as a ZERO pest.

**Keywords:** Black Gram, Coconut Oil, Storage Pest, Traditional Practices