NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA
SURATHKAL

MINUTES

OF

TWENTY SEVENTH MEETING OF
BOARD OF STUDIES

Date   :   30.10.2014 (Thursday)
Time   :   10.30 AM
Venue   :   Board Room,
                      N.I.T.K - Surathkal,
                      Srinivasnagar, Mangalore
                      PIN - 575 025.

Minutes of the Twenty Seventh combined Board of Studies (UG, PG, Research) Meeting held on 30th October, 2014 at 10.30 A. M. in the Board Room, NITK, Surathkal.

Members Present:

1.	Dr. Katta Venkataramana	...	Chairman
2.	Dr. A. Kandasamy	...	Member
3.	Dr. M.C.Narasimhan	...	Member
4.	Dr. Udayakumar R Y	...	Member
5.	Dr. M.B.Saidutta	...	Member
6.	Dr. G. S. Dwarakish	...	Member
7.	Prof. Subba Rao	...	Member
8.	Dr. M. Aruna	...	Member
9.	Dr. Annappa	...	Member
10.	Dr. M. S. Bhat	...	Member
11.	Sri. Jora M Gonda	...	Member
12.	Dr. Ananthanarayana V S	...	Member
13.	Dr. Vidya Shetty k.	...	Member
14.	Dr. Ravikiran Kadoli	...	Member
15.	Dr. Prasad Krishna	...	Member
16.	Dr. Jagannath Nayak	...	Member
17.	Prof. B. Ramachandra Bhat	...	Member
18.	Dr. Murulidhar N N	...	Member
19.	Prof. H. D. Shashikala	...	Member
20.	Prof. A. H. Sequeira	...	Member
21.	Prof. K. B. Kiran	...	Member
22.	Dr. Bijuna C Mohan	...	Member
23.	Mr. Kamlabh Kumar Singh	...	Member
24.	Mr. Gaurav Chawdhury	...	Member
25.	Mr. K. Ravindranath	...	Secretary/Dy. Registrar (Acad)

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Minutes of Twenty seventh BOS meeting held on 30.10.2014

The Chairman (BOS) and Dean (Academic) chaired the meeting and welcomed all the members to the **Twenty Seventh BOS meeting** and thanked the outgoing members and introduced new BOS members.

The minutes of **Twenty Sixth BOS** meeting was reviewed and approved as there were no comments received from the members.

ITEM No: 27-BOS-1: **Introduction of the New Electives for B Tech 2012 Curriculum onwards:** **The Department of Mechanical Engineering:** The BOS resolved to approve the inclusion of : 1) ME345 - Electronics for Automotive Systems (2-0-2) 3 2) ME448 – Rotor Dynamics (3-0-0) 3 as new Elective Course for B Tech (Mechanical Engineering) 2012 Curriculum onwards. The details are attached as an **ANNEXURE- I, Page No. 6.**	For Senate Approval
ITEM No: 27-BOS-2: **Modification of existing course in B Tech Curriculum-** **The Department of Mechanical Engineering:** The BOS resolved to approve the modification of existing course: 1) ME 211 - Fuels and Combustion (3-0-0) 3 2) ME 204 - Manufacturing Engineering - I (3-1-0) 4 3) ME 253 - Manufacturing Engineering - II (3-1-0) 4 The proposed changes are attached as on **ANNEXURE- I, Page No. 6-7.**	*For Senate Approval*
ITEM No: 27-BOS-3: **Modification for the Existing Course in the PG Curriculum-** **The Department of Mechanical Engineering:** The BOS resolved to approve the modification of existing course: 1. ME815 - Automotive Electronics The proposed changes are attached as on **ANNEXURE- II, Page No. 8.**	*For Senate approval*

ITEM No: 27-BOS-4:
 	
Introduction of new 900 level courses for Ph D-
    The Department of Information Technology:
    The BOS resolved to approve the inclusion of new 900 level courses:
    1)   IT923 : Affective Computing   4
    2)   IT924 : Big Data Analytics   4
    3)   IT925 : Bio-Inspired Computing   4
    4)   IT926 : Cloud Computing   4
    5)   IT927 : Green Computing   4
 	
    The details are attached as an **ANNEXURE- III, Page No. 9-13.**
	For Senate Approval

ITEM No: 27-BOS-5: **Ph D Research Scholarship Scheme under "Visvesvaraya PhD Schemes for Electronics and IT":** The BOS noted the proposal submitted by the Department of Electronics and Communication Engineering regarding PhD Admission 2014-15 in December session under "Visvesvaraya PhD Schemes for Electronics and IT" sponsored by Ministry of Communication and Information Technology (MCIT, DeitY), Government of India.	*Reporting to Senate*

ITEM No: 27-BOS-6:
 	
Introduction Inclusion of External Additional Guides : –
 a) **The Department of Electronics and Communication Engineering:**
    The BOS resolved to approve Dr. S Mohan, Visiting Professor, CeNSE, IISc., Bangalore as Additional Guide for Mr. Ramshanker N. [Reg. No. EC13P01] in the Department of Electronics and Communication Engineering.
 	
 b) **The Department of Physics:**
    The BOS resolved to approve Dr. Harish C Barshilia, Chief Scientist   (Sc. G) & Joint Head at NAL be considered as Additional Guide for   Mr. Sibin K P. [Reg. No. PH14P03] in the Department of Physics.
 	
 c) **The Department of Mechanical Engineering:**
    The BOS resolved to approve Dr. R Rajendran, Deputy Head, Propulsion, CSIR-NAL, Bangalore as an Additional Guide for Mr. Felix [Reg. No. ME13P02] in the Department of Mechanical Engineering
 	
 d) **The Department of Mechanical Engineering:**
    The BOS resolved **NOT** to approve Dr. Kiran Aithal, Professor and Controller of Examination, NMAMIT NITTE as an Additional Guide for Mr. Ramesh Babu [Reg. No. ME13P03] in the Department of Mechanical Engineering.
 	
 e) **The Department of Chemistry:**
    The BOS resolved to approve Dr. B. E. Amitha Rani, Principal Scientist, Surface Engineering Devision, NAL Bangalore, as an Additional Guide for Mr. Prakashaiah B. G. [Reg. No. CY13P02] in the Department of Chemistry.
	Reporting to Senate

ITEM No: 27-BOS-7: **Academic Calendar and Schedule for the Even Semester 2014-15 and Odd Semester 2015-16 :** The BOS resolved to approve the Academic Calendar and Schedule for the Even Semester 2014-15 and Odd Semester 2015-16 with some modifications. The approved new Academic Calendar is given in **[ANNEXURE-IV, Page No.14-17]**	*For Senate approval*

ITEM No: 27-BOS-9:

Mandatory requirement of guide from the sponsoring organization for M. Tech (Research) program :–
The BOS resolved to recommend modification of *NITK Regulations Specific to M Tech (Research) (Clause 4.5)* as follows:

Existing	*Proposed*	
External Registrant need to have an additional Research Guide from the organization from which he / she is sponsored. The bio-data of intending Additional Guides from outside the Institute shall be scrutinized and recommended by the DPGC and approved by Dean (Academic)	External Registrant may have an additional Research Guide from the organization from which he / she is sponsored. The bio-data of intending Additional Guides from outside the Institute shall be scrutinized and recommended by the DPGC and approved by Dean (Academic).	*For Senate approval*

ITEM No: 27-BOS-10: **Conversion of 'Internal Registrants – Project Staff of NITK' to full-time Research Scholars under Ph D and M.Tech (Research):-** After detailed discussions, it was resolved that the present regulations are sufficient and no modifications are necessary.	*Reporting to Senate*

ITEM No: 27-BOS-11: **Proposal of change in regulations specific to Ph D Thesis submission and Assessment :-** The BOS members felt that the matter is related with administrative issue, so it was resolved to withdraw the Item.	*Reporting to Senate*

The Secretary (BOS) proposed the vote of thanks to the chair and to the members.

(K. Ravindranath)
Secretary –BOS, NITK

(Dr. Katta Venkataramana)
Chairman-BOS, NITK

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Department of Mechanical Engineering
Agenda for BOS meeting
UG curriculum

1. New Open Elective to be added:

ME345 Electronics for Automotive Systems
(2:0:2)3

Introduction to Automotive systems. Fundamentals of Electronic devices and systems: Analog Circuit Building Blocks, Amplifiers, Filters, Data Converters, Sensors And Actuators in Automobile, Electronic Control Unit. Interfacing and system integration. Engine Electronics: Throttle body fuel injection, multi point fuel injection, gasoline direct injection, common rail direct injection, variable timing ignition, distributor less ignition. Engine mapping, on - board diagnostics. Transmission Electronics: Multiplexing and De-multiplexing electronically controlled automatic transmission system.
Laboratory: Experiments on open loop ECU using LABCAR, embedded controllers, actuators and sensors integration

W H & Anglin D L, "Automotive Mechanics", Tata McGraw Hill Publishing Company, 2004.
Robert Bosch "Automotive Hand book", 6th edition, 2004.
William B.Riddens "Understanding Automotive Electronics", 5th edition- Butter worth Heinemann Woburn- 1998.
Jack Erjavec, "Automatic Transmissions", Delmar Publishers,1st edition,2005
Ronald K Jurgen, "Automotive Electronics Handbook", McGraw Hill, 2000.
Ljubo Vlacic, Michel Parent & Furnio Harshima, "Intelligent Vehicle Technologies "- Theory and Applications – Butterworth and Heinemann Publications 2001

Justification: There is a growing demand for interdisciplinary knowledge of undergraduate students to pursue a successful career in automotive sector, which has huge potential for growth.

2. New electives to be added:

ME448 ROTOR DYNAMICS (3-0-0)3

Introduction to dynamics of rotating machinery. Critical speeds of rotors and factors affecting them such as gyroscopic effects, internal damping, unequal moments of inertia, fluid film effects of bearings and seals. Unbalance response and Stability of rotors under various influences, including turbo machinery effects. Balancing of Rotors. Modelling and Calculation methods in rotor dynamics for advanced applications. Malfunction analysis, diagnostics and condition monitoring of rotors. Applications and Case studies.

B.S. Prabhu and A.S. Sekhar, "Dynamic Analysis of Rotating Systems and Applications", Multi Science Publishing Co. Ltd, Essex, England, UK, 2008.
M.L. Adams "Rotating Machinery Vibration, From Analysis to Troubleshooting", Marcel Dekker Inc. New York, 2001
E. Kramer, "Dynamics of Rotors and Foundations", Springer Verlag, Berlin, 1993
J.S. Rao, "Rotor dynamics", New Age International Pvt. Ltd., New Delhi, 1996
J. M. Vance, "Rotor dynamics of Turbomachinery", John Wiley and Sons, New York, 1998.

Justification: To enhance employability potential of the UG students in companies like BHEL, GE, NTPC, ATKINS, Ingersoll Rand, L&T, Nuclear power corporations, etc.

3. Syllabus modification for following subjects to be considered:

ME211 Fuels and Combustion (3-0-0) 3

Fuels and classification, Basics of thermodynamics and chemical equilibrium, Chemical Kinetics, simplified Reaction Mechanisms, Laminar Premixed Flames, Laminar Diffusion Flames, Droplet Evaporation and Burning, emissions and control, application problems- design of wood burning stove and gas turbine combustion chamber.

D. P. Mishra, "Fundamentals of Combustion", First edition 2008, Prentice Hall of India.
Stephen R. Turns, "An Introduction to Combustion: Concepts and Applications", third edition 2011, McGraw Hill.
A. W. Date, "Analytic Combustion", First edition 2011, Cambridge University Press.

H. S. Mukunda, "Understanding combustion", Second edition 2009, Universities Press of India, ISBN 10: 8173716854.

Justification: The focus of current syllabus is limited to the Fuels related to I.C. engines. However, combustion as a subject is highly diverse with applications ranging from household gas stove burner to gas turbine combustion chamber. Therefore, the new revised syllabus is proposed to cover this diverse nature of combustion as a subject.

ME 204 MANUFACTURING ENGINEERING – I   (3-1-0) 4

Metal Casting Processes: Patterns, Sand Moulding practices, Sand testing, Risering and Gating Design, Special casting Processes, Solidification Mechanisms, Melting Practices, Casting Defects.
Metal Joining Processes : Gas Welding, Arc Welding, Advanced Welding processes, Welding Defects, Brazing, Soldering.
Metal Forming Processes : Rolling, Forging, Extrusion, Presswork & Cold Forming.
Elements of Powder Metallurgy and Plastic Moulding.

Heine, Loper & Rosenthal, Principles of Metal Casting –TMH , 2001
P.N. Rao – Manufacturing Technology- vol 1- Foundry, Forming & Welding, 4thEdiition , - TMH 2013.
Ghosh and Mallick – Manufacturing Science, Prentice Hall PTR, 2001
Kalpakjian and Schmidt – Manufacturing Engineering and Technology, 4th edition Pearson Education India, 2001
Mikell P. Groover -Introduction to Manufacturing Processes, Edition 1 - Wiley 2011

ME 253 MANUFACTURING ENGINEERING – II   (3-1-0) 4

Metal Removal Processes : Introduction to Machine Tools and Classification, Lathes, Drilling, Shaping, Slotting & Planing, Milling, Horizontal Boring, VTL, Plano-Milling, Gear Cutting machines, Grinding – surface, cylindrical, internal,
Superfinishing – honing , lapping ; Cutting tools – single and multipoint, Grinding wheels ; Cutting Fluids; Standard work holding devices – chucks, vices,collets.
Jigs, Fixtures and Dies – concepts of location, clamping and tool guiding.
CNC machines, Machining Centres and FMS.
Non- Conventional Machining Processes.

Ghosh and Mallick – Manufacturing Science, Prentice Hall PTR, 2001
Kalpakjian and Schmidt – Manufacturing Engineering and Technology, 4th edition Pearson Education India, 2001
P.N. Rao – Manufacturing Technolgy vol 2 – Metal cutting & Machine Tools 3rd Ediition , - TMH 2013
Mikell P. Groover -Introduction to Manufacturing Processes, 1st Edition - Wiley 2011
Edward Trent and Paul Wright - Metal cutting – 4th Edition - Butterworth-Heinemann, 2000
Edward Hoffman - Jig and Fixture Design – 5th Edition - Cengage Learning India, 2008
M. H. A. Kempster - An introduction to jig and tool design – 3rd Edition -   Hodder and Stoughton, 1974.
Cyril Donaldson - Tool Design - McGraw-Hill Companies; 3rd Edition, 1973.

Justification
These two courses are parts of Manufacturing Engineering and hence it is considered to be treated as Part-I and Part-II, instead of under two different headings.

i. *The Metal Removal process is currently spread over two semesters. Consolodating the two modules in one semester by realigning the other existing modules will streamline the teaching as well as the learning process.*
ii. *It is felt that exposure to Metal forming processes e.g. Rolling, Forging, Extrusion is vital for students of Mechanical Engineering especially for those opting careers in production/manufacturing. So also is at least a basic knowledge of Powder Metallurgy and Plastic Moulding. Hence these processes is proposed to be included in the curriculum.*

Department of Mechanical Engineering
Agenda for BOS meeting

PG curriculum

1. Elective subject, **ME815 Automotive Electronics:** Convert L-T-P from (3:0:0)3 to (2:0:2)3

Justification: The course requires hands on experience in the area of sensors, actuators related to power train electronics. Currently, the department is having a full fledged automotive electronics laboratory supported by Robert-Bosch Inc.

Syllabus:

ME815 Automotive Electronics (2:0:2)3

Automotive Mechanical Systems, Vehicle Systems, Power Train System, Transmission System, Braking System, Steering System, Need for Electronics in Automotive Systems, Overview of Vehicle Electronic Systems, Embedded Systems, Hardware Module, Software Module, Debug Interfaces, BDM and JTAG, Introduction to Embedded RTOS, Embedded System in Automotive Applications, Embedded System Communication Protocols, Vehicle communication protocols.

Laboratory: Experiments on open loop ECU using LABCAR, embedded controllers, actuators and sensors integration

Lack Erjavec Automotive Technology A systems approach, , 4th edition, Thomson Delmar Learning, 2005, USA;
Willliam B., Ribens Understanding Automotive Electronics, , 6-th Edit., An Inprint of Elsevier Science, USA, 2004;
Robert Bosch GmbH Diesel-Engine Management, 3th edition., Bentley Publishers, 2004;
Robert Bosch,GmbH Gasoline-Engine Management, 2nd edition., Bentley Publishers , 2004;
Robert Bosch GmbH,Automotive Handbook, 6th edition. Bentley Publishers, 2004;

IT923: Topics in Affective Computing   4 Credits

Course Description:

Affective computing represents a broad, interdisciplinary research and practice area focusing on a range of topics, including: affect-adaptive human-computer interaction, affective user modelling, computational models of emotion, cognitive-affective agent architectures; emotion sensing and recognition; and emotion expression. The course will also explore applications of affective computing in a variety of contexts, including intelligent tutoring, affect-adaptive user interfaces, affective gaming, and intelligent social robots and virtual agents. Introduction to affective computing will be provided through a combination of lectures, student presentations of selected literature, projects and class discussion. The course content and format will be appropriate for graduate and advanced undergraduate students in computer science, cognitive science, psychology, human factors, and industrial engineering, as well as students in the arts, digital media, gaming, and those interested in the use of technology in education and healthcare.

Objective:

Affective Computing is computing that relates to, arises from, or deliberately influences emotions. This course overviews the theory of human emotion (how it arises from and influences cognition, the body and the social environment), techniques for recognizing and synthesizing emotional behavior, and illustrate how these can be applied to application design. This course will enable the students to make decisions about the appropriateness of incorporating emotion in specific applications involving human computer interaction, including affect-adaptive user interaction in intelligent tutoring, gaming, and interaction with robots and virtual characters. The course will provide the necessary background for selecting the relevant emotion theories, empirical data, and techniques and methods for sensing, recognition, modelling and expression of emotions, across a variety of contexts.

Syllabus:

Introduction to affective computing; Emotion research from **Cyber Psychology & Behaviour:** concepts related to 'affective computing' (e.g., emotion, mood, personality, attitude) in ways that facilitate their use in computing; Computational models of human emotion processes (e.g., decision-making models that account for the influence of emotion; predictive models of user emotional state); Studies on cross-cultural, group and cross-language differences in emotional expression; **Behavior Generation & User interaction:** Computational models of visual, acoustic and textual emotional expression for synthetic and robotic agents; Models of verbal and nonverbal expression of various forms of affect that facilitate machine implementation; Methods to adapt interaction with technology to the affective state of users; Computational methods for influencing the emotional state of people; New methods for defining and evaluating the usability of affective systems and the role of affect in usability; Methods of emotional profiling and adaptation in mid- to long-term interaction; Application of affective computing including education, health care, entertainment, customer service, design, vehicle operation, social agents/robotics, affective ambient intelligence, customer experience measurement, multimedia retrieval, surveillance systems, biometrics, music retrieval and generation; **Sensing & analysis:** Algorithms and features for the recognition of affective state from face and body gestures; Analysis of text and spoken language for emotion recognition; Analysis of prosody and voice quality of affective speech; Recognition of auditory and visual affect bursts; Recognition of affective state from central (e.g. fMRI, EEG) and peripheral (e.g. GSR) physiological measures; Methods for multi-modal recognition of affective state; Recognition of group emotion.

References:

1. Picard, R. (2000), "Affective Computing", Cambridge, MA: MIT Press.
2. Fellous, J-M, and Arbib, M. (2005), "Who Needs Emotions? The Brain Meets the Robot", Oxford University Press.
3. Minsky, M. (2007), "The Emotion Machine: Commonsense Thinking, Artificial Intelligence & Future of Human Mind", NY, NY: Simon & Schuster.
4. Lewis, M., Haviland-Jones, J.M., Feldman Barrett, L. (2010), "Handbook of Emotions", Third Edition. NY, NY: The Guilford Press.
5. Journal Articles from IEEE Transactions on Affective Computing [2010 to Till Date].

IT924: Topics in Big Data Analytics   4 Credits

Course Description:

The recent explosion of social media and the computerization of every aspect of economic activity resulted in the creation of mountains (big data) of mostly unstructured data: web logs, videos, speech recordings, photographs, e-mails, Tweets, and others. In a parallel development, computers keep getting ever more powerful and storage ever cheaper. Today, we have the ability to reliably and cheaply store huge volumes of data, efficiently analyze them, and extract business and socially relevant information. This course brings together several key IT technologies used in manipulating, storing, and analyzing big data. The course will review MapReduce techniques for parallel processing and Hadoop, an open source framework that allow us to cheaply and efficiently implement MapReduce on internet scale problems. It will focus on related tools that provide SQL-like access to unstructured data: Pig and Hive. It will analyze NoSQL storage solutions exemplified by HBase for their critical features: speed of reads and writes, data consistency, and ability to scale to extreme volumes. It will also examine memory resident databases and streaming technologies which allow analysis of data in flight, i.e. real time. It will also highlights in working with the public Cloud as unlimited resource for big data analytics. Almost all industries are bracing into the challenge of Big Data and want to dig out valuable information to get insight to solve their challenges. A data scientist needs to keep up with this ever changing trends to be able to create a state of-the-art solution for real-world challenges.

Objective:

Students will gain knowledge on analyzing Big Data. It serves as an advanced course for students who are expecting to face Big Data storage, processing, analysis, visualization, and application issues on both workplaces and research environments. Gain knowledge on this fast-changing technological direction. Big Data Analytics is probably the fastest evolving issue in the IT world now. New tools and algorithms are being created and adopted swiftly. Get insight and hands-on experience on what tools, algorithms, and platforms to use on which types of real world use cases through project based learning.

Syllabus:

Introduction to Big Data Analytics, Big Data Analytics Platforms, Big Data Storage and Processing, Big Data Analytics Algorithms, Linked Big Data Analysis - Graph Computing and Network Science, Big Data Visualization, Big Data Mobile Applications, Large Scale Machine Learning, Big Data Analytics on Specific Processors, Hardware and Cluster Platforms for Big Data Analytics.

References:

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj [2013], "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley CIO.
2. David Loshin [2013], "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann.
3. Mike Barlow [2012], " Real-Time Big Data Analytics: Emerging Architecture", [Kindle Ed.], O'Reilly Media.

IT925: Topics in Bio-Inspired Computing   4 Credits

Course Description:

Biological organisms cope with the demands of their environments using solutions quite unlike the traditional human-engineered approaches to problem solving. Biological systems tend to be adaptive, reactive, and distributed. Bio-inspired computing is a field devoted to tackling complex problems using computational methods modeled after design principles encountered in nature. This course is strongly grounded on the foundations of complex systems and theoretical biology. It aims at a deep understanding of the distributed architectures of natural complex systems, and how those can be used to produce informatics tools with enhanced robustness, scalability, flexibility and which can interface more effectively with humans. It is a multi-disciplinary field strongly based on biology, complexity, computer science, informatics, cognitive science, robotics, and cybernetics.

Objective: Students will be introduced to fundamental as well as advanced topics in bio-inspired computing so that they can build up their proficiency in the application of various algorithms for real-world problems.

Syllabus:

Life: Life and Information, Logical Mechanisms of Life; Computation: Universal Computation and Computability, Simulations and Realizations; Limitations of Life: Computational Beauty of Nature, Bio-inspired computing, Natural computing, Biology through the lens of computer science; Complex Systems and Artificial Life: Complex Networks, Self-Organization and Emergent Complex Behavior, Cellular Automata, Boolean Networks, Development and Morphogenesis, Open-ended evolution; Evolutionary Algorithms: Evolution and Adaptation, Genetic Algorithms, Genetic Programming, Differential evolution; Collective Behavior and Swarm Intelligence: Social Insects, Stigmergy and Swarm Intelligence, Competition and Cooperation, Communication and Multi-Agent simulation, Meta-Heuristics: Ant Colony Optimization, Artificial Bee Colony algorithm, Bat-Termite Algorithm Particle Swarm Optimization, Cat Swarm Optimization, Glowworm swarm optimization, Grey-Wolf Optimization, Wolf-pack Optimization, Multi-Swarm Optimization; Immuno-Computing: Artificial immune systems, Distributed design for computational intelligence, Engineering Application.

References:

1. Nunes de Castro, Leandro [2006], "Fundamentals of Natural Computing: Basic Concepts, Algorithms and Applications", Chapman & Hall.
2. Floreano, D. and C. Mattiussi [2008], "Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies", MIT Press.
3. Nunes de Castro, Leandro and Fernando J. Von Zuben [2005], "Recent Developments in Biologically Inspired Computing", MIT Press.
4. Forbes, N. [2004], "Imitation of Life: How Biology is Inspiring Computing", MIT Press.
5. Flake, G. W. [1998], "The Computational Beauty of Nature: Computer Explorations of Fractals, Complex Systems and Adaptation", MIT Press.

IT926: Topics in Cloud Computing   4 Credits

Course Description:

Cloud Computing has become a driving force for information technology over the past several years, and it is hinting at a future in which we won't compute on local computers, but on centralized facilities operated by third-party compute and storage utilities. Governments, research institutes, and industry leaders are rushing to adopt Cloud Computing to solve their ever-increasing computing and storage problems arising in the Internet Age. In recent years, large investments have been made in massive data centers supporting cloud services, such as map-reduce jobs and online web services, by companies such as Amazon, Google, Microsoft, Yahoo!, and Facebook. Moreover, some companies like Amazon have provided public cloud services with shared storage, computation, and bandwidth resources. This course will deal with the critical technology trends and new challenges in cloud and data center designs for different trade-offs of performance, scalability, manageability, and cost across the application, infrastructure, and network layers. This course will also explore solutions and learn design principles for building large network-based systems to support both compute/data intensive computing across geographically distributed infrastructure. Topics include cluster & grid computing and resource management, Virtual Machines and Virtualization of Clusters and Data Centers, programming models, application models, system characterizations, and implementations. Further discussions will be grounded in the context of deployed Cloud Computing systems, such as Amazon EC2 and S3, Microsoft Azure, Google App Engine, Eucalyptus, Nimbus, OpenStack, Google's MapReduce, Yahoo's Hadoop, Microsoft's Dryad, Sphere/Sector, and many other systems.

Objective: The students will be exposed to Cloud Computing Paradigms in terms of current state-of-the-art challenges and trade-offs when mapping different applications to the cloud in real-time scenario.

Syllabus:

Overview of Cloud Computing: Cloud Computing Characteristics (elasticity, multi-tenant, on-demand, ubiquitous access, usage metering, self-service, SLA-monitoring, etc.), Cloud Computing and SOA, Enterprise Cloud drivers and adoption trends, Typical Cloud Enterprise workloads, Cloud service models & types (public, private, hybrid, and community clouds), Cloud deployment models (IaaS, PaaS, SaaS, BPaaS), Cloud ROI models, Cloud reference architectures, Cloud standards (OSDIAPIs, etc.), Technology providers vs. Cloud providers vs. Cloud vendors, Planning Cloud transformations (suitability assessment, future state definition, financial assessment and platform selection, roadmap definition); Infrastructure as a Service (IaaS): Virtualization-VMware/Xen/KVM virtualization, adaptive virtualization, Cloud Computing & on-demand resource provisioning, Infrastructure services (storage, compute, services management, cloud brokers, etc.), IaaS vendor solutions: Amazon EC2, HP, Microsoft, Savvis, Terremark, Right Scale, Rackspace cloud, IBM, Oracle, Verizon; Platform as a Service (PaaS): Cloud platform services (monitoring/management, application servers, messaging, data management, development and testing, integration, business intelligence, etc.), PaaS vendor solutions: EMC, Google App Engine, HP, IBM, Microsoft Azure, Rackspace, Savvis, Verizon, force.com, VMware vFabric, OpenStack, Eucalyptus, Storage-as-a-Service platforms (Google Storage, ObjectStore S3, Amazon Dynamo, etc.); Software as a Service (SaaS): Cloud application development lifecycle; SaaS platform services (application development, application migration, SaaS implementation, business intelligence - Cloud-based/big data/real time analytics); Quality of Service (QoS) Aware Load Balancing in Large Scale Heterogeneous Cloud Environment and other Recent Trends in Cloud Computing.

References:

1. Kai Hwang, Jack Dongarra, Geoffrey C. Fox [2011], " Distributed and Cloud Computing: From Parallel Processing to Internet of Things", Morgan Kauffmann.
2. Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi [2013], "Mastering Cloud Computing", Tata McGraw-Hill.
3. Toby Velte, Anthony Velte, Robert C. Elsenpeter [2010], " Cloud Computing: Practical Approach", McGraw-Hill.
4. Journal Articles from IEEE Transactions on Cloud Computing [2013 to Till Date].

IT927: Topics in Green Computing   4 Credits

Course Description:

Our societal energy usage is rising at an alarming rate and thus it is critical to manage its consumption more efficiently for long term sustainability. This course introduces students to the exciting area of "Green Computing" aiming to help students acquire the knowledge and skills needed to do research in this space. It is organizationally divided into two tracks. The first track is "Energy-Efficient Computing", which considers the state of the art techniques for improving the energy efficiency of mobile devices, to laptop and desktop class computers and finally to data centers. We will cover energy efficiency across the hardware/software stack, starting from the individual components like processors and radio interfaces to system level architectures and optimizations. The second track is "Applying Computing towards Sustainability", covering topics that leverage computing to reduce the energy footprint of our society. In particular, the course will focus on Smart Data Centers, Smart Cluster & Grid Computing, covering topics such as sensing, modelling and controlling the energy usage of Data Centers, as well as new operating systems and software stacks for the smart infrastructure, as well as the privacy and security issues with the new emerging technologies such as Cloud Computing and Internet of Things (IoT).

Objective: The students will be exposed to recent advances in the green technologies to save energy and reduce the carbon footprint of modern computing and engineered systems. A holistic coverage is given ranging from single device issues to algorithms for reducing power consumption of data centers, transportation systems, smart buildings and smart grid. Further, the students will also be exposed to new and emerging research directions in green computing and thereby identifying open issues and challenges.

Syllabus:

Introduction to Green Cloud Computing, Migrating into Cloud, Green IT: An Overview, Green Devices and Hardware, Green Software; Green Data Centers: Data Centers and Associated Energy Challenges, Data Centre IT Infrastructure, Data Centre Facility Infrastructure: Implications for Energy Efficiency, IT Infrastructure Management, Green Data Centre Metrics, Data Centre Management Strategies, Green Data Storage: Introduction, Storage Media Power Characteristics, Energy Management for Hard Disks, System-Level Energy Management; Green Networks and Communications: Introduction, Objectives of Green Network Protocols, Green Network Protocols and Standards, Sustainable Information Systems and Green Metrics; Green Cloud Computing and Environmental Sustainability: Energy Usage Model, Features of Clouds Enabling Green Computing, Towards Energy Efficiency of Cloud Computing, Green Cloud Architecture; Energy Adaptive Computing for Ecosystem: Implementing the Data Center Energy Productivity Metric in a High-Performance Computing Data Center, Sustainable Dynamic Application Hosting Across Geographically Distributed Data Centers, Energy Efficient task scheduling and Resources allocation at Data Center using Bio inspired Techniques, Energy Efficient Virtual Machine Provisioning and Migration w.r.t S.L.A agreements; Cloud Computing Tools : Simulators such as CloudSim, iCanCloud, Open Stack, Green Cloud, Open Nebula, Aneka; Recent Trends in Green Computing and IT.

References:

1. *"The Green Computing Book: Tackling Energy Efficiency at Large Scale"*, Edited by Wu-chun Feng, Chapman & Hall/CRC Computational Science, CRC Press, June 2014.
2. *"Design Technologies for Green and Sustainable Computing Systems"*, Edited by Partha Pratim Pande, Amlan Ganguly, Krishnendu Chakrabarty, Springer, 2013.
3. *"Harnessing Green IT: Principles and Practices"*, Edited by San Murugesan, G.R. Gangadharan, Wiley, 2012.
4. *"Cloud Computing: Principles and Paradigms"*, Edited by Rajkumar Buyya, Jams Broberg, Andrzej Goscinski, Wiley, February 2011.

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL
ACADEMIC CALENDAR   January – May 2015

Even-semester

Week No.	SUN	MON	TUE	WED	THU	FRI	SAT	Week No.
w01	Dec-28	Dec-29 Course Registration Inst.fee payment without fine	Dec-30 Classes Start * Course Registration Inst.fee payment without fine	Dec-31 Registration with fine Inst.fee payment with fine	Jan-01 Registration with fine Inst.fee payment with fine	Jan-02 Registration with fine Inst.fee payment with fine	Jan-03	w01
w02	Jan-04 Id-E-Milad	Jan-05 Last date for Registration with fine Inst.fee payment with fine	Jan-06	Jan-07	Jan-08	Jan-09 Drop/cU-options	Jan-10	w02
w03	Jan-11	Jan-12	Jan-13	Jan-14 Makara Sankranthi	Jan-15	Jan-16	Jan-17	w03
w04	Jan-18	Jan-19	Jan-20	Jan-21	Jan-22	Jan-23	Jan-24	w04
w05	Jan-25	Jan-26 Republic Day	Jan-27	Jan-28	Jan-29	Jan-30	Jan-31	w05
w06	Feb-01	Feb-02	Feb-03	Feb-04	Feb-05	Feb-06	Feb-07	w06
w07	Feb-08	Feb-09	Feb-10	Feb-11	Feb-12	Feb-13	Feb-14	w07
w08	Feb-15	Feb-16 Mid-Sem Exam	Feb-17 Mid-Sem Exam	Feb-18 Mid-Sem Exam	Feb-19 Mid-Sem Exam	Feb-20 Mid-Sem Exam	Feb-21	w08
w09	Feb-22	Feb-23	Feb-24	Feb-25 Mid Sem Results	Feb-26	Feb-27	Feb-28	w09
w10	Mar-01	Mar-02	Mar-03	Mar-04	Mar-05 Incident: No Classes Holi: No Classes	Mar-06 Incident: No Classes	Mar-07 Incident	w10
w11	Mar-08 Incident	Mar-09 No Classes	Mar-10 Class Commi. Meeting Monday Time Table	Mar-11 Class Commi. Meeting	Mar-12 Class Commi. Meeting	Mar-13 Class Commi. Meeting	Mar-14	w11
w12	Mar-15	Mar-16	Mar-17	Mar-18	Mar-19	Mar-20	Mar-21	w12
w13	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	w13
w14	Mar-29	Mar-30	Mar-31	Apr-01 Thursday Time Table	Apr-02 Mahaveera Jayanthi	Apr-03 Good Friday	Apr-04	w14
w15	Apr-05	Apr-06**	Apr-07	Apr-08	Apr-09	Apr-10	Apr-11	w15
w16	Apr-12	Apr-13 Pre-Registration	Apr-14 Pre-Registration	Apr-15	Apr-16	Apr-17	Apr-18	w16
w17	Apr-19	Apr-20 Course Evaluation	Apr-21*** Course Evaluation	Apr-22	Apr-23	Apr-24 Classes End	Apr-25	w17
w18	Apr-26	Apr-27 End-Sem .Exam	Apr-28 End-Sem .Exam	Apr-29 End-Sem .Exam	Apr-30 End-Sem .Exam	May-01 End-Sem .Exam	May-02	w18
w19	May-03	May-04 Buddha Poornima	May-05 End-Sem .Exam	May-06 End-Sem .Exam	May-07 End-Sem .Exam	May-08 End-Sem .Exam	May-09	w19
w20	May-10	May-11 End Sem Results	May-12 DUGC/DPGC/DRPC Meeting & Grades Display	May-13 Appeal on Grades	May-14 EAAB Meeting	May-15 Grades to Exam Section	May-16	w20

* Course Instructors to provide Course Plan & Evaluation Plan

*** Announcement of Attendance Status and In Semester Marks

Note: Odd Semester Reopening-20th July 2015 (Tentative)

**Depts. to announce list of courses &instructors for the next semester

**Depts. (Academic) Submission of M.Tech Thesis on or after: 30th April 2015
End Semester Make-up Exam from May 25th to 29th May, 2015

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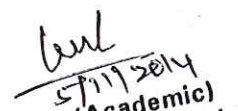# NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

ACADEMIC SCHEDULE

Even-Semester   **January – May 2015**

Sl.No	Activity	Dates
1	Course Registration	Dec 29 - Dec-30
2	Classes START and Course Instructors to provide Course Plan & Evaluation Plan	Dec-30
3	Registration With Fine	Dec-31- Jan -05
3	Last Date for Registration	Jan -05
4	Drop/cU options	Jan - 09
5	Makara Sankranthi	Jan - 14
6	Republic Day	Jan - 26
7	Mid-Sem-Exams (all degree programs)	Feb 16 - Feb 20
8	Announcement of Mid-Sem-Exam Performance	Feb 25
9	**INCIDENT**- No Classes	Mar 05 - Mar 08
11	Class Committee Meeting	Mar 10 - Mar 13
12	Mahaveera Jayanthi	Apr 02
13	Good Friday	Apr 03
14	Dept. to announce list of Courses & Course Instructors for the next semester	Apr 06
15	Pre-Registration for Next Semester	Apr 13 - Apr 14
16	Course Evaluation / Announcement of Attendance Status and In Semester Marks by Course Instructors	Apr 20 -Apr 21
17	Classes END	Apr 24
18	End-Sem-Exams (all degree programs)	Apr 27 - May 08
19	Buddha Poornima	May 04
20	Last Date for Announcement of End-Sem-Exam Performance and Display of Grades by Course Instructor	May 11
21	DUGC/DPGC/DRPC Meetings (Grades Finalization & Approval) Display of the Finalised Grades by DUGC / DPGC / DRPC	May 12
22	Appeal on Grades/	May 13
23	DAAB Meeting	May 14
24	Grades to be sent to Exam Section	May 15
25	Semester Make –up Examination	May 25 - 29
26	Submission of M.Tech Thesis	April 30

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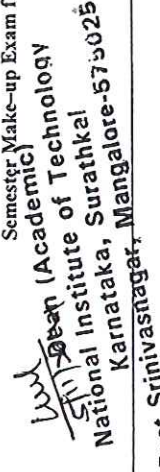
NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

ACADEMIC CALENDAR

Odd Semester   **July-Dec 2015**

week	SUN	MON	TUE	WED	THU	FRI	SAT	week
w00	July-12	July-13	July-14	July-15	July-16 Branch Change (III Sem)	July-17	July-18 Idu'l Fitr	w00
w01	July-19	July-20 Course Registration Inst.fee payment without fine	July-21 Classes Start * Course Reg.Inst.fee payment without fine	July-22 Registration with fine Inst.fee payment with fine	July-23 Registration with fine Inst.fee payment with fine	July-24 Registration with fine Inst.fee payment with fine	July-25	w01
w02	July-26	July-27 Last date for Registration with fine & Inst.fee payment with fine	July-28	July-29	July-30	July-31	Aug-01	w02
w03	Aug-02	Aug-03 Drop/cU options	Aug-04	Aug-05	Aug-06 Inst. Foundation Day- No Classes	Aug-07	Aug-08	w03
w04	Aug-09	Aug-10	Aug-11	Aug-12	Aug-13	Aug-14	Aug-15 Independence Day	w04
w05	Aug-16	Aug-17	Aug-18	Aug-19	Aug-20	Aug-21	Aug-22	w05
w06	Aug-23	Aug-24	Aug-25 Friday's Time Table	Aug-26	Aug-27	Aug-28	Aug-29	w06
w07	Aug-30	Aug-31	Sept-01	Sept-02	Sept-03	Sept-04	Sept-05	w07
w08	Sept-06	Sept-07 Mid-Sem.Exam	Sept-08 Mid-Sem.Exam	Sept-09 Mid-Sem.Exam	Sept-10 Mid-Sem.Exam	Sept-11 Mid-Sem.Exam	Sept-12	w08
w09	Sept-13	Sept-14	Sept-15	Sept-16	Sept-17 Ganesh Chathurthi	Sept-18	Sept-19	w09
w10	Sept-20	Sept-21 Mid Sem Results	Sept-22	Sept-23	Sept-24	Sept-25 ID-Ul-Zuha(Bakrid)	Sept-26	w10
w11	Sept-27	Sept-28	Sept-29	Sept-30 Thursday's Time Table	Oct-01	Oct-02 Mahatma Gandhi's Birthday	Oct-03	w11
w12	Oct-04	Oct-05	Oct-06	Oct-07	Oct-08 Engineer-No Classes	Oct-09 Engineer-No Classes	Oct-10 Engineer	w12
w13	Oct-11 Engineer	Oct-12 No Classes	Oct-13 Class Commi. Meeting	Oct-14 Class Commi. Meeting	Oct-15 Class Commi. Meeting	Oct-16 Class Commi. Meeting	Oct-17	w13
w14	Oct-18	Oct-19	Oct-20	Oct-21 Maha Astami	Oct-22 Vijayadashami	Oct-23	Oct-24 Muharram	w14
w15	Oct-25	Oct-26	Oct-27	Oct-28	Oct-29	Oct-30**	Oct-31	w15
w16	Nov-01	Nov-02	Nov-03	Nov-04	Nov-05	Nov-06	Nov-07	w16
w17	Nov-08	Nov-09 Pre-Registration	Nov-10 Pre-Registration	Nov-11 Deepavali	Nov-12 Course Evaluation	Nov-13 Course Evaluation	Nov-14	w17
w18	Nov-15	Nov-16	Nov-17***	Nov-18	Nov-19	Nov-20 Classes END	Nov-21	w18
w19	Nov-22	Nov-23 End-Sem.Exam	Nov-24 End-Sem.Exam	Nov-25 Gurunanak's Birthday	Nov-26 End-Sem.Exam	Nov-27 End-Sem.Exam	Nov-28 End-Sem.Exam	w19
w20	Nov-29	Nov-30 End-Sem.Exam	Dec-01 End-Sem.Exam	Dec-02 End-Sem.Exam	Dec-03 End-Sem.Exam	Dec-04 End-Sem.Exam	Dec-05	w20
w21	Dec-06	Dec-07 End Sem Results	Dec-08 DUGC/DPGC/DRPC Meeting	Dec-09 Appeal on Grades	Dec-10 DAAB Meeting	Dec-11 Grades to Exam Section	Dec-12	w21
w22	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	w22
w23	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25 Christmas Day	Dec-26	w23
w24	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31			w24

*   Course Instructors to provide Course Plan & Evaluation Plan

**   Depts. to announce list of courses &instructors for the next semester

***   Announcement of Attendance Status and In Semester Marks

Even Semester Reopening-29th December 2015 (Tentative)

Semester Make-up Exam from 15th Dec to 18th Dec, 2015

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ACADEMIC SCHEDULE

Odd-Semester   **July-Dec 2015**

Sl.No	Activity	Dates
1	Branch Change Counseling (IIIrd Sem)	July 16
2	Idul Fitr (Pernal)	July 18
3	Course-Registration, Institute fee payment without fine	July 20
4	Classes Start ,Course-Registration, Institute fee payment without fine , Course Instructors to provide Course Plan & Evaluation Plan	July 21
5	Registration with fine , Institute fee payment with fine	July 22 - July24
6	Last Date for Registration with fine, & Institute fee payment with fine	July 27
7	Last Date for Drop/cU options	Aug 03
8	Institute Foundation Day	Aug 06
9	Independence Day	Aug 15
10	Mid-Sem-Exams: (B.Tech / M.Tech / MCA / M.Sc / MBA / Ph.D)	Sept 07 -Sep11
11	Ganesh Chathurthi	Sep 17
12	Announcement of Mid-Sem Exam Performance	Sept 21
13	ID-UL-Zuha (Bakrid)	Sept 25
14	Mahatma Gandhi's Birthday	Oct 02
15	Engineer –NO Classes	Oct 08-Oct 11
16	Class Committee meeting	Oct 13- Oct 16
17	Maha Astami	Oct 21
18	Vijayadashami	Oct 22
19	Muharram	Oct 24
20	Departments to announce list of courses & Instructors for the next semester	Oct 30
21	Pre-Registration	Nov 09 – Nov10
22	Deepavali	Nov 11
23	Course Evaluation	Nov 12 – Nov 13
24	Announcement of attendance status and in-semester marks	Nov 17
25	Classes END	Nov 20
26	End-Sem-Exams: (BTech / MTech / MCA / MSc / MBA / PhD)	Nov 23 – Dec 04
27	Guru Nanaks Birthday	Nov 25
28	End Sem Exam Results	Dec 07
29	DUGC/DPGC/DRPC Meetings (Grades Finalization & Approval) Display of the Finalised Grades by DUGC / DPGC / DRPC	Dec 08
30	Appeal on Grades	Dec 09
31	DAAB Meeting	Dec 10
32	Grades go to Exam Section	Dec 11
33	Make-up examination	Dec 15 -18
34	Christmas	Dec 25

5/11/2014

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