



**NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA  
SURATHKAL**

***MINUTES***

***OF***

***THIRTY THIRD MEETING OF***

***BOARD OF STUDIES***

**Date : 26.03.2019 (Tuesday)**  
**Time : 3.00 PM**  
**Venue : Board Room,**  
**N.I.T.K - Surathkal,**  
**Srinivasnagar, Mangalore**  
**PIN - 575 025.**

# NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

## Minutes of the Thirty third combined Board of Studies (UG, PG & Research) Meeting held on Tuesday, March 26, 2019 in the Board Room, NITK, Surathkal.

### MEMBERS PRESENT

1)	Dr. M. B. Saidutta	...	Chairman
2)	Dr. A. H. Sequeira	...	Member
3)	Dr. Jagannath Nayak	...	Member
4)	Dr. Subhash C Yaragal	...	Member
5)	Dr. K Panduranga Vittal	...	Member
6)	Dr. Amba Shetty	...	Member
7)	Dr. Varghese George	...	Member
8)	Dr. Bijay Mihir Kunar	...	Representative of HOD
9)	Dr. Alwyn Roshan Pais	...	Member
10)	Dr. P Santhi Thilagam	...	Member
11)	Dr. Shashidhar G Koolagudi	...	Member
12)	Dr. Ashvini Chaturvedi	...	Member & Representative of HOD
13)	Dr. Ram Mohan Reddy	...	Member
14)	Dr. Prasanna B D	...	Representative of HOD
15)	Dr. Shrikantha S. Rao	...	Member
16)	Dr. Kumar G N	...	Member
17)	Dr. S.M. Murigendrappa	...	Member
18)	Dr. Anandhan Srinivasan	...	Member
19)	Dr. Arun Mohan Isloor	...	Member
20)	Dr. B.R Shankar	...	Member
21)	Dr. H.S. Nagaraja	...	Member
22)	Dr. S.Pavan Kumar	...	Member
23)	Dr. Venkatesa Perumal	...	Member
24)	Dr Mallikarjun Angadi	...	Member
25)	Dr. Vidya Shetty	...	Member
26)	Dr. Muralidhar Kulkarni	...	Member
27)	Dr. Udaya Bhat	...	Member
28)	Mr. K. Ravindranath	...	Member
29)	Ms. Priyanka Dattanand Amadalli	...	Member
30)	Mr. Kamlabh Kumar Singh	...	Secretary



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NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

**Minutes of Thirty Third (33<sup>rd</sup>) BOS meeting held on  
26.03.2019 (Tuesday)**

The Chairman (BOS) and Dean (Academic) chaired the meeting and welcomed all the members to the **Thirty Third BOS meeting**. He informed the members of the BOS that two external members from GEC Jhalawar has been nominated as External Invited members for the BOS. However they couldn't come for 33<sup>rd</sup> BOS meeting. He also informed that Librarian has also been included as member of the BOS.

The minutes of **Thirty second BOS** meeting was approved as there were no comments received from the members.

**ITEM No: 33-BOS - 1: Introduction of new UG Programme - proposal of Department of MACS**

The BoS resolved after detailed deliberation to constitute a sub-committee to look-into the Course structure and Course Content of the proposed B.Tech program proposed by the Department of MACS. The Sub-committee will submit its final report to the Chairperson, Board of Studies who is authorized to take decision on behalf of the BOS for submission to the Senate.

**For  
Senate  
approval**

**ITEM No: 33-BOS - 2: Introduction of new UG Programme - proposal of Department of Physics**

The BoS resolved after some deliberation to treat the proposal of Department of Physics for introduction of new BTech programme from the academic year 2019-20 as withdrawn.

**For  
Senate  
approval**

**ITEM No: 33-BOS - 3: Change of name of M Tech Programme (Computational Mathematics (CMA) - Proposal of Department of MACS**

The BoS resolved to ratify the recommendation the proposal of Department of MACS for Change of name of M.Tech Programme (**Computational Mathematics (CMA)**) to M.Tech in **Computational and Data Science (CDS)** from the academic year 2019-20.

**Reporting  
to Senate**



# NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

**ITEM No: 33-BOS - 4: Modification for Honours Degree requirement (UG Curriculum 2018) - Dept. of E&C Engg.**

The BoS resolved not to recommend the modification for Honours Degree as proposed by the department of Electronics & Communication Engineering. However the existing regulation is modified suitably.

Honours Degree requirement (UG Curriculum 2018) Proposed by E&C Engg.

**For  
Senate  
approval**

<b>Existing in draft UG curriculum of 2018</b>	<b>Modification requested</b>
Students seeking Honours degree shall credit PG courses offered by the Department of Electronics and Communication Engineering. The list of courses available for crediting in a given semester shall be decided by the DUGC. In addition, such students shall do their Major Project in the department.	Requirement for Honors Degree: 1. Students seeking Honors degree shall credit PG courses offered by the Department of Electronics and Communication Engineering. 2. They shall earn a minimum of 20 credits form these courses. 3. The list of courses available for crediting in a given semester shall be decided by the DUGC. 4. All students registered for Honours Degree shall do their Major Project in the department.
<b>Existing in UG Regulations of 2018</b>	<b>Modified</b>
<p>3.8 Honors programme in B Tech</p> <p>a) A student in a particular discipline can take additional specified courses at postgraduate level in the same discipline totaling 15 to 20 credits. If he/she gets a GPA of 6.0 and above in these courses, then it will find a mention in their grade cards and degree certificate.</p> <p>b) A student can opt for Honors in Third Semester and register for Honors Courses from Fifth to Eighth Semesters. Students who have cleared all the courses of first and second semester in first attempt and have obtained a CGPA of 8.0 and above are eligible to register for Honors courses.</p> <p>c) In case a student does not get a GPA of 6.0 and above in Honors courses, he/she is not eligible to receive Honors degree. However, these courses may then be counted towards their elective requirement.</p>	<p>3.8 Honors programme in B Tech</p> <p>a) A student in a particular discipline can take additional specified courses (by the respective DUGCs) at postgraduate level in the same discipline totaling 15 to 20 credits. If he/she gets a GPA of 6.0 and above in these courses, then it will find a mention in their grade cards and degree certificate.</p> <p>b) A student can opt for Honors in Third Semester and register for Honors Courses from Fifth to Eighth Semesters. Students who have cleared all the courses of first and second semester in first attempt and have obtained a CGPA of 8.0 and above are eligible to register for Honors courses.</p> <p>c) In case a student does not get a GPA of 6.0 and above in Honors courses, he/she is not eligible to receive Honors degree. However, these courses may then be counted towards their elective requirement.</p>



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**ITEM No: 33-BOS-5: Introduction of new UG program Elective Courses:**

**a) Department of Electronics and Communication Engineering -**

The BOS resolved to recommend the inclusion of following elective in the list of Electives of UG programme.

EC459 Optimization (3-1-0) 4

EC460 Neural Networks and Deep Learning (3-1-0) 4

EC477 Computational Imaging and Physics (3-1-0) 4

The details are attached as an **ANNEXURE-I, Page No. 1-3**

**b) Department of Information Technology**

The BOS resolved to recommend the inclusion of following elective in the list of Electives of UG programme.

IT 464 Foundations of Machine Learning (3-0-2) 4

IT 465 Cryptocurrencies and Blockchain Technologies (3-0-2) 4

The details are attached as an **ANNEXURE-II, Page No. 4**

**c) The Department of Mechanical Engineering**

The BOS resolved to recommend the inclusion of following elective in the list of Electives of UG programme.

ME 431 Continuum Mechanics (3-0-0) 3

The details are attached as an **ANNEXURE-III, Page No. 5**

**d) The School of Management**

The BOS resolved to recommend the inclusion of following elective in the list of Electives of UG programme.

SM 459 Advanced Course on Entrepreneurship (3-0-0) 3

The details are attached as an **ANNEXURE- IV, Page No. 6**

**For  
Senate  
approval**

**ITEM No: 33-BOS-6: Introduction of new PG program Elective Courses:**

**a) Department of Electronics and Communication Engineering**

The BOS resolved to recommend the inclusion of following electives of PG programme with a rider that EC876 name be changed as it clashes with EC477 which also has the same course name.

EC875 Nonlinear Dynamics, Chaos And Fractals (4-0-0) 4

EC876 Computational Imaging and Physics (4-0-0) 4

The details are attached as an **ANNEXURE- V, Page No. 7**

**For  
Senate  
approval**



**b) The School of Management**

The BOS resolved to recommend the inclusion of following elective in the list of Electives of PG programme.

SM 859 Machine Learning for Business Management (3-0-0) 3

SM 831 Marketing Metrics - *with Prerequisite : Marketing Management, Marketing Research* (3-0-0) 3

The details are attached as an **ANNEXURE- VI, Page No. 8-9**

**c) The Department of Information Technology**

The BOS resolved to recommend the inclusion of following elective in the list of Electives of PG programme.

IT 832 Blockchain Technologies and Applications (3-0-2) 4

- Decentralization and Smart Contracts

IT 833 Advanced Time Series Analysis (3-0-2) 4

IT 834 Performance Evaluation of Computer Systems and Software (3-0-2) 4

The details are attached as an **ANNEXURE- VII, Page No. 10**

**d) The Department of Physics**

The BOS resolved to recommend the inclusion of following elective in the list of Electives of PG programme.

PH 870 Quantum Computation (3-0-0) 3

The details are attached as an **ANNEXURE- VIII, Page No. 11**

**e) The Department of Applied Mechanics and Hydraulics**

The BOS resolved to recommend the inclusion of following elective in the list of Electives of PG programme, with appropriate change of name for the course.

AM825 Advanced applications of open source technology (2-0-2) 3  
in marine structures

The details are attached as an **ANNEXURE- IX, Page No. 12**

**f) The Department of Electrical and Electronics Engineering**

The BOS resolved to recommend the inclusion of following elective in the list of Electives of PG programme.

PS871 Soft-switching Power Converters (3-0-0)3

Pre-requisites: Basic course in power electronics

PS872 Soft-switching Power Converters Laboratory (0-0-3)2

The details are attached as an **ANNEXURE- X, Page No. 13-14**

**For  
Senate  
approval**



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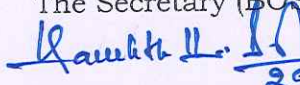
<p><b>ITEM No: 33-BOS-7:</b>  <b>Modification in the contents of the courses in the UG Curriculum:</b>  The BOS resolved to recommend the modification in the contents of the courses in the UG Curriculum of the School of Management.</p> <p><b>Entrepreneurship Development (SM 451) to SM451 Foundation Course on Entrepreneurship (3-0-0)3</b></p> <p>The details are attached as an <b>ANNEXURE- XI, Page No. 15</b></p>	<b>For Senate approval</b>						
<p><b>ITEM No: 33-BOS-8:</b>  <b>Modification in the contents of the courses in the PG Curriculum 2018:</b>  The BOS resolved to recommend the modification in the contents of the courses in the UG Curriculum.</p> <p><b>a) The School of Management</b>  Econometrics : Theory and Applications (MBA 8G12) to SM860 Data Analytics : Business Decision Making under the head Analytics (3-0-0) 3  The details are attached as an <b>ANNEXURE- XII, Page No. 16</b></p> <p><b>b) The Department of Mechanical Engineering</b>  Applications of Numerical Methods in Design (ME-715) to Applications of FEM in Design.  The details are attached as an <b>ANNEXURE- XIII, Page No. 17</b></p>	<b>For Senate approval</b>						
<p><b>ITEM No: 33-BOS - 9:                      Minor changes in the UG curriculum</b></p> <p>The BOS resolved to recommend the minor changes in the UG Curriculum.</p> <p><b>Department of Electronics and Communication Engineering</b></p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Existing</th><th style="text-align: left;">Modification</th></tr> </thead> <tbody> <tr> <td>1. EC391 Signals and Systems</td><td>EC391 Analog Electronics</td></tr> <tr> <td>2. EC393 Analog Electronics</td><td>EC393 Signals and Systems</td></tr> </tbody> </table>	Existing	Modification	1. EC391 Signals and Systems	EC391 Analog Electronics	2. EC393 Analog Electronics	EC393 Signals and Systems	<b>For Senate approval</b>
Existing	Modification						
1. EC391 Signals and Systems	EC391 Analog Electronics						
2. EC393 Analog Electronics	EC393 Signals and Systems						
<p><b>ITEM No: 33-BOS - 10:                      Inclusion of External Additional Guides: The Department of Computer Science &amp; Engineering.</b></p> <p>The BOS resolved to approve that, Dr. Animesh Acharjee, Senior Research Fellow / Senior Scientist, Institute of Cancer and Genomic Science University of Birmingham be considered for inclusion as an Additional Research Guide Ms. Saraswati Koppad, (177CO005) in the department of Computer Science &amp; Engineering.</p>	<b>Reporting to Senate</b>						




# NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

<b>ITEM No: 33-BOS - 11: Recognition of faculty as Research Guides:</b>  The BOS resolved to ratified the list of faculty who were recognized as Research Guide after 32 <sup>nd</sup> BOS meeting based on the respective DRPC recommendations.	<b>Reporting to Senate</b>
<b>ITEM No: 33-BOS - 12: List of Minor subjects offered by Dept. of Chemistry</b>  The BOS resolved to recommend the inclusion of minor subjects offered by Dept. of Chemistry in the UG Curriculum 2018. The details are attached as an <b>ANNEXURE- XIV, Page No. 18-19</b>	<b>For Senate approval</b>
<b>ITEM No: 33-BOS-13: Modification in B.Tech and M.Tech Curriculum - Proposal of department of Civil Engineering.</b>  The BOS resolved to recommend the inclusion of following new electives for PG Curriculum 2018 1. M Tech (Environmental Engineering) CV880 : Environment and Climate Change (3-0-0) 3 as new Electives 2. M Tech (Geotechnical Engineering) CV830 : Geo-Disaster Mitigation (3-0-0) 3 The BOS resolved to recommend the introduction of new elective for UG Curriculum 2018 CV491 -Bituminous Materials , Mixtures and Pavements (3-0-0) 3 The BOS resolved to recommend the changes in UG Curriculum of Department of Civil Engineering.  The details are attached as in <b>ANNEXURE-XV, Page No.20-25</b>	<b>For Senate approval</b>
<b>ITEM No: 33-BOS-14: Minor in Management - Proposal of School of Management</b>  The BOS resolved to recommend the inclusion of list of minors in Management as proposed by the School of Management. <b>ANNEXURE- XVI, Page No.26</b>	<b>For Senate approval</b>
<b>ITEM No: 33-BOS-15: Corrections in 2018 Regulations &amp; Curriculum</b>  The BOS Chairman informed the members that the UG and PG Curriculum 2018 needs thorough checking due to numerous errors committed by the respective departments in submitting data. Erroneous data related to Course Codes, Course names, Course Credits, Inclusion of new courses by the Department has been noticed at several places. In-view-of this it is decided to invite Department representatives for thorough vetting of curriculum of their respective departments. The changes arising out of it may be incorporated in to the curriculum by the Chairperson, BOS and ratified later.	<b>For Information to Senate</b>

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

  
**(Kamlabh Kumar Singh)**  
 Secretary -BOS, NITK

  
**(Dr. M. B. Saidutta)**  
 Chairman-BOS, NITK



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING  
NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA SURATHKAL**

Date: 15-03-2019

**Minutes of the meeting of DFC of Dept. of E&C Engg. held on 15-03-2019 at 2.30 PM in EC Meeting Hall.**

**Agenda:**

Agenda Items from Dept. of E&C Engg. for Board of Studies Meeting scheduled for 26<sup>th</sup> March 2019

The DFC resolved to send the following agenda items for the BoS meeting scheduled for 26<sup>th</sup> March 2019.

**3. Introducing New Electives**

(a) Following two new electives to be introduced in 2016 and 2017 UG Curriculum

**EC459 OPTIMIZATION (3-1-0) 4**

Convex sets and Convex functions, Level sets and Gradients, Unconstrained Optimization: Search methods, Gradients Methods, Newton Method, Conjugate Direction Methods, Quasi-Newton Methods. Linear Programming: Standard Form Linear Programs, Simplex method,

Duality and Non Simplex Methods. Nonlinear Constrained Optimization: Problems with equality constraints, Problems with Inequality Constraints, Convex Optimization Problems, Algorithms for Constrained Optimization: Projected Gradient Methods and Penalty Methods.

*Lieven Vandenbergh and Stephen P. Boyd, Convex Optimization, Cambridge University Press, 2004.*

*Dimitris Bertsimas, John N. Tsitsiklis, Introduction to Linear Optimization, Athena Scientific Series, 1997.*

*Aharon Ben-Tal and Arkadi Nemirovski, Lectures on Modern Convex Optimization: Analysis, Algorithms, and Engineering Applications, SIAM, 2001.*

**EC460 NEURAL NETWORKS AND DEEP LEARNING (3-1-0) 4**

Linear Regression, Logistic regression, Basic neuron structure, Perceptron, error functions, optimization – gradient descent, Multilayer perceptron, transfer function, nonlinearities, learning, backpropagation, function approximations, overfitting, underfitting, Deep networks, challenges, regularization techniques – Norm penalties, early stopping, drop outs, dataset augmentation, bagging and ensemble methods, Convolutional Networks – Convolution, pooling, variants, transfer learning, Sequence Modeling – Recurrent neural networks, Bidirectional RNNs, architectures, LSTM, Application examples – Computer Vision, Speech recognition, NLP.

*Simon S. Haykin, Neural Networks and Learning Machines, 3rd Ed, Pearson, 2009.*

*José C. Principe, Neil R. Euliano, W. Curt Lefebvre, Neural and Adaptive Systems: Fundamentals through*

*Simulations, John Wiley and Sons, 2000.*

*Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.*

**(b) Following electives to be added to 2018/2019 UG Curriculum**

**EC477 IMAGING, INFORMATICS AND COMPUTATIONAL PHYSICS (3-1-0) 4**

Physics of imaging, material structure, Imaging methods and modalities, computational aspects, theoretical and applied; modalities in medical imaging, geophysics, applied physics, biology, astronomy, remote sensing and optics; methods and applications in nuclear medical imaging physics and radiology, image guided radiotherapy; computational photography, inverse problems and reconstruction, image informatics; use of optimization, compressed sensing and pattern recognition and machine learning theory; applications of deep learning and artificial intelligence.

*Kedar Khare, Fourier Optics and Computational Imaging, Wiley, 2015.*

*H. K. Huang, PACS and Imaging Informatics: Basic Principles and Applications 2nd Edition, Wiley-Blackwell, 2010.*

*E. Russell Ritenour and William Hendee, Medical Imaging Physics, Wiley 2002.*

*B.H Brown, R.H Smallwood, D.C. Barber, P.V Lawford, D.R Hose, Medical Physics and Biomedical Engineering, CRC Press 1998.*



*S Webb, The Physics of Medical Imaging, Institute of Physics, 1988.*

*Paul Suetens, Fundamentals of Medical Imaging, Cambridge University Press, 2009.*

*Thayalan K, The Physics Of Radiology And Imaging, Jaypee Brothers 2014.*

*Tetsuo Asano, Geometry, Morphology, and Computational Imaging, Springer 2002.*



UG:

**IT464: Foundations of Machine Learning**

(3-0-2) 4

Linear algebra and probability theory basics - Machine learning- Types- Classification- Regression- Multi-class classification. dimensionality reduction -Linear and Logistic Regression. Naive Bayes, Parameter Estimation, Sequential Pattern Classification . Neural Network Basics - Backpropagation - Support Vector Machines, Kernel methods - Bias-Variance tradeoff. Regularization and model/feature selection. Ensemble Methods: Boosting, Bagging, Random Forests. Unsupervised learning - K-Means clustering- EM Algorithm - Reinforcement learning - introduction to deep learning . Recent Applications and trends of Machine learning.

*Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017.*

*Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.*

*Stephen Marsland, — Machine Learning: An Algorithmic Perspective, Second Edition, 2014.*

*Pattern recognition and machine learning by Christopher Bishop, Springer Verlag, 2006.*

**IT465: Cryptocurrencies and Blockchain Technologies**

(3-0-2) 4

Introduction to Crypto currency, peer-to-peer network, Abstract Models for BLOCKCHAIN - GARAY model - RLA Model, Hybrid models cryptographic basics for cryptocurrency - a short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography, Bitcoin - Wallet - Blocks - Merkle Tree transaction verifiability - anonymity - forks - double spending. Ethereum, Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts, Applications of smart contracts, Block chain Application in various areas- Health care, Insurance, IoT etc..

*Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.*

*Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015 ( article available for free download) { curtain raiser kind of generic article, written by seasoned experts and pioneers}. 2. J.A.Garay et al, The bitcoin backbone protocol - analysis and applications*

*EUROCRYPT 2015 LNCS VOL 9057, ( VOLII ), pp 281-310.. serious beginning of discussions related to formal models for bitcoin protocols. 3. R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017. A significant progress and consolidation of several principles). 4. R.Pass et al, Fruitchain, a fair blockchain, PODC 2017*



Minutes of DUGC Meeting held on 20/3/2019

The DUGC members agreed to include the following subject as an elective for the B. Tech programme and the same will be notified to BOS meeting.

**ME 431 Continuum Mechanics (3- 0-0) 3**

Mathematical Preliminaries - Vector and Tensor calculus

Deformation Kinematics - Deformation gradient, E & L formulations, Time dependent motion, material derivatives

Equilibrium of deformable bodies - Traction and stress, Equilibrium and balance principles. Different Stress Measures

Material models - Material frame indifference, Thermodynamic considerations, Plasticity

Boundary value problems and Numerical solutions to BV problems

Structural mechanics of beams - Kinematic hypothesis, Planar beam: Timoshenko & Bernoulli-Euler formulations;

**References**

1. J. E. Marsden and T.J.R. Hughes, Mathematical Foundations of Elasticity, Dover Publications, 1994.
2. G. A. Holzapfel, Nonlinear Solid Mechanics: A Continuum Approach for Engineering, John Wiley & Sons, 2000.
3. P. Chadwick, Continuum Mechanics: Concise Theory and Problems, Dover Publications, 1999.
4. L. E. Malvern, Introduction to the Mechanics of a Continuous Medium, Prentice Hall Series in Engineering of the Physical Sciences, 1969.
5. Y. C. Fung, Foundations of Solid Mechanics, Prentice Hall, 1965.
6. P. G. Ciarlet, Mathematical Elasticity, Volume III: Theory of Shells, North Holland, 2000.

**DUGC Members**

Sathyabhama A	Sathyabhama A	
Hemantha Kumar	Hemantha Kumar	
Dr. H. Suresh Ithaler	Dr. H. Suresh Ithaler	
DR. N. GNANASEKARAN	DR. N. GNANASEKARAN	
Dr. Kumar G. N.	Dr. Kumar G. N.	
K. R. GURUPRASAD	K. R. GURUPRASAD	

N. Gnanasekaran  
(Dr. N. GNANASEKARAN)  
DUGC Secretary

G. N. Kumar  
Dr. Kumar G. N.  
DUGC chairman

S. S. Sathya  
HOD Mechanical

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SM/451

**Foundation Course on Entrepreneurship** (3-0-0)3

Self Discovery; Opportunity discovery, Customer and Solution – understanding who is the customer, identify job, pains, gains and early adopters, Establish your venture's unique value proposition and competitive advantage; Basics of business models and lean canvas; Validation – refine value proposition with blue ocean strategy, build solution demo, prototype development; Understanding cost structures, bootstrapping and initial financing; Positioning and branding, Sales plan using funnel approach; Support – Project management, operating a business.

*Books for Reference:*

Mariotti, Steve. The Young Entrepreneur's Guide to Starting and Running a Business., New York NY: Random House, Inc.2000.

Osterwalder Alexander, Business Model Generation, Wiley India Pvt. Ltd., 2017.

Entrepreneurship Development and Management – EDI Ahmedabad.

Vasant Desai, Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House. 2000.

SM/459 **Advanced Course on Entrepreneurship** (3-0-0)3

Pivoting – evaluating different business models, analyze competitors, product management; Business planning – yearly sales, people and financial plan; Growth strategy – scaling customers, revenue and sources of funding; Team building ; Branding and channel strategy - Understand and examine different channels ; Leveraging technology – Identifying technology needs and choosing key technologies, technology as a competitive advantage; Measuring progress – establishing key metrics and measuring; Legal – Incorporating, regulations.

*Books for Reference:*

John R. Bessant, Joe Tidd, Entrepreneurship, Wiley, 2018

Beverly Rudkin IngleDesign Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work 1st ed. Edition, Wiley, 2018

Value Proposition Design, Osterwalder Alex, Wiley india Pvt. Ltd.

Department      Faculty      Signatures:



Rakesh H.

Darvaz



Sant  
CSAVITA BHAT

  
Sant

Chopalakumma B.V.

ky













**EC875 NONLINEAR DYNAMICS, CHAOS AND FRACTALS**

(4-0-0)4

Review of linear systems; discrete and continuous, difference and differential equation modeling and solution, dynamics of linear and nonlinear systems, maps and flows, phase-plane analysis, bifurcations, limit cycles, attractors, chaotic behavior, strange attractors, chaotic systems and their analysis, fractals, Mandelbrot and Julia sets, iterated function systems, fractal dimension, stable and unstable manifolds, multifractals, applications.

*Steven H. Strogatz, Nonlinear Dynamics And Chaos: With Applications To Physics, Biology, Chemistry, And Engineering, Addison-Wesley, 1994.*

*MW Hirsch, S. Smale, RL Devaney, Differential equations, dynamical systems, and an introduction to chaos, Academic Press. 2012.*

*Drazin, P. G. Nonlinear systems. Cambridge, UK: Cambridge University Press, 1992.*

*Peitgen, H-O., H. Jurgens, and D. Saupe. Chaos and Fractals: New Frontiers of Science, Springer, 2004.*

*M. Barnsley, Fractals everywhere, Academic Press, 1993.*

**EC876 COMPUTATIONAL IMAGING AND PHYSICS**

(4-0-0) 4

Imaging methods and modalities, computational aspects of analysis, theoretical and applied; modalities in medical imaging, geophysics, applied physics, biology, astronomy, remote sensing and optics; methods and applications in nuclear medical imaging physics and radiology, image guided radiotherapy; computational photography, inverse problems and reconstruction, modeling, analysis; use of optimization, compressed sensing and pattern recognition and machine learning theory; applications of deep learning and artificial intelligence.

*Kedar Khare, Fourier Optics and Computational Imaging, Wiley, 2015.*

*B.H Brown, R.H Smallwood, D.C. Barber, P.V Lawford, D.R Hose, Medical Physics and Biomedical Engineering, CRC Press 1998.*

*S Webb, The Physics of Medical Imaging, Institute of Physics, 1988.*

*Paul Suetens, Fundamentals of Medical Imaging, Cambridge University Press, 2009.*

*Thayalan K, The Physics Of Radiology And Imaging, Jaypee Brothers 2014.*

*Tetsuo Asano, Geometry, Morphology, and Computational Imaging, Springer 2002.*

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 मोबाइल/वॉट्सएप: 9411013444-81111



### Machine Learning for Business Management

**Objective:** To explore the concepts and techniques for the discovery of patterns hidden in large data sets and the application of techniques in various domains of business management to students.

Concepts – Scope & Objectives Data mining process – Data mining functionalities - Data preprocessing, Supervised Learning: Introduction, Decision Tree Induction, Bayesian Classification: Naive Bayes. Rule Based Classification, Artificial Neural Network: Classification by Back propagation. Support Vector Machines, Associative Classification, K-NN classifier, Case-Based Learning, Rough set, Fuzzy set approaches, Hidden Markov models. Ensemble model: Bagging, Boosting. Accuracy and Error Measures, Evaluating the Accuracy of a Classifier, Model Selection, Feature selection. Unsupervised Learning-I: Types of Data in Cluster Analysis, Clustering Methods- Partitioning Methods: K-Means, . Fuzzy Clustering Methods: FCM, PCM, FPCM, PFCM. Hierarchical Methods: Agglomerative and Divisive, Balanced Iterative Reducing Clustering using Hierarchies, Unsupervised Learning-II: Grid-Based Methods: STatistical INformation Grid, Model-Based Clustering Methods: EM algorithm, Self Organizing Map. Clustering High-Dimensional Data: CLustering In QUEst, Projective clustering, Outlier Analysis. Soft Computing Components: Neighborhood based algorithms-Simulated annealing, Tabu search. Population based algorithms Evolutionary computation: Evolutionary programming and strategies, Genetic algorithms, Differential evolution. Swarm Intelligence: Ant colony optimization, Particle swarm optimization.

Text Book: 1. Jiawei Han and Micheline Kamber. Data Mining Concepts and Techniques. Morgan Kaufmann publication, 2006.

2. Xin-she Yang. Nature-Inspired Metaheuristic Algorithms. Luniver press, 2010.

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 Gopalakrishna B.V.  
 Prashant  
 Ramesh  
 Page 8



## Marketing Metrics

**Pre requisite: Marketing Management, marketing research**

**OBJECTIVE:** At the end of the course, the student will be able to

- Make sure we have a common definition of the metrics being used in marketing today
- Identify metrics that should be used by marketers,
- Show how we can use marketing metrics to help shape how much we should be spending and on which marketing activities,
- Draw the link from marketing expenditures to the financial well-being and to take a effective marketing decisions.

Marketing Metrics Introduction to marketing metrics, linking marketing to financial consequences, Share of heart, Share of mind and Share of market, Role and importance of marketing metrics in strategic marketing decisions, Margins & Profits and Customer Profitability Selling Price, variable cost, average variable cost, market spending, Break even point and Target volume, customer, recency, retention, customer life time value, prospect life time value, acquisition versus retention spending Product and Portfolio Management Trail, repeat, penetration, volume, CAGR, fair share draw, cannibalization rate, brand equity metrics, conjoint utilities: segmentation, customer preference and volume projection. Sales Force and Pricing Sales force coverage, goals, results, compensation, pipeline analysis, facings, shares of shelf, out of stock, inventory turns, markdowns etc., Price premium, reservation, percent good value, price elasticity, optimal, own, cross and residual elasticity, Advertising, Promotion and Web Metrics baseline sales, incremental, lifts, redemption, rebates, deal, pass through, waterfall, Impressions, GRP, OTS, CPM, reach, frequency, share of voice, click through rates, cost per impression, clicks, acquisitions, visitors and abandonment.

### TEXT BOOK:

- Marketing Metrics: 50+ Metrics Every Executive Should Master, Wharton School Publishing, 2006, ISBN 0-13-187370-9

### REFERENCES:

- Marketing Metrics: 103 Key Metrics Every Marketer Needs Philip Kotler, Ned Roberto John Wiley & Sons Inc December 2006, ISBN-10: 0470821329.
- Managing Customers for Profit : Strategies to Increase Profits and Build Loyalty, 1/e, V. Kumar Pearson Education 2008, ISBN No. 9788131719800
- Other Reading materials of relevant articles from the international marketing journals.

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Geopalarumma B.M.



PG:

**IT832: Blockchain Technologies and Applications - Decentralization and Smart Contracts (3-0-2) 4**

**Topics:** Theories of Cryptocurrency, Block chain and Distributed Systems. Understanding the emerging abstract models of Block Chain. Block Chain and Bitcoin Security, Application of Block Chain, Byzantine fault tolerance, Security of Blockchain and decentralised schemes, Attacks on Block Chain systems, Light weight protocols and algorithms based on Block Chain, Block Chain Based IoT solutions, Block Chain in crowdsourcing and crowdsensing, Block chain in Cyber Physical Systems, Block Chain in Social Networking, Block chain in 5G, Block Chain in edge and Cloud Computing, Block Chain and Trust managements, Business Model Destruction/ creation caused by Block chain, Business value of blockchain

Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. *Bitcoin and cryptocurrency technologies: a comprehensive introduction*. Princeton University Press, 2016.

Dac-Nhuong Le, Gulshan. *Cryptocurrencies and Block Chain and Applications, Decentralisation and Smart Contracts*, Wiley Publications.

Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, *IEEE Symposium on security and Privacy*, 2015 (article available for free download) {curtain raiser kind of generic article, written by seasoned experts and pioneers}. 2. J.A.Garay et al, *The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS Vol 9057, (VOLII)*, pp 281-310.. serious beginning of discussions related to formal models for bitcoin protocols. 3. R.Pass et al, *Analysis of Blockchain protocol in Asynchronous networks*, *EUROCRYPT 2017. A significant progress and consolidation of several principles*. 4. R.Pass et al, *Fruitchain, a fair blockchain*, *PODC 2017*

**IT833: Advanced Time Series Analysis (3-0-2) 4**

Stationary processes, ensemble, random walk Vs trend, periodicity, linear process; Estimators mean, ACF, PACF, variogram; Properties covariance, normality; Regression, models for trend, differencing, backshift operator; Harmonic regression, periodogram, signal processing; Nonparametric regression, smoothing, periodic functions; Model selection, AIC, BIC, SIC, bias-variance trade-off; ARMA models; Estimation, MLE, LS, forward-backward; State-space models, Kalman filter, hidden state, HMM, Switching models, hidden Markov models (HMM), GARCH, stochastic volatility, financial models; Heteroscedasticity, Wavelets, Vector Autoregressive (VAR) Models, Integrated Variables and Cointegrated VAR Models, Time-varying parameter and Bayesian VARs, Multivariate GARCH Models

Shumway, R.H. and Stoffer, D.S., *Time Series Analysis and its Applications: With R Examples*, Springer.

Pole A., West M. and Harrison P.J., *Applied Bayesian Forecasting and Time Series Analysis*. Chapman-Hall.

Tsay, R. S. *Analysis of Financial Time Series*, John Wiley and Sons.

West, M. and Harrison, P.J. (1997), *Bayesian Forecasting and Dynamic Models*, Springer-Verlag.

**IT834: Performance Evaluation of Computer Systems and Software (3-0-2) 4**

Operational Laws: Little's Law, response-time law, asymptotic bounds, modification analysis, performance metrics;

Markov Chain Theory: discrete-time Markov chains, continuous-time Markov chains, renewal theory, time-reversibility; Poisson Process: memorylessness,

Bernoulli splitting, uniformity, PASTA;

Queueing Theory: open networks, closed networks, time-reversibility, Renewal Reward, M/M/1, M/M/k, M/M/k/k, Burke's theorem, Jackson networks, classed networks, load-dependent servers, BCMP result and proof, M/G/1 full analysis, M/G/k, G/G/1, transform analysis (Laplace and z-transforms);

Simulations: time averages versus ensemble averages, generating random variables for simulation, Inspection Paradox;

Modeling Empirical Workloads: heavy-tailed property, Pareto distributions,

heavy-tailed distributions, understanding variability and tail behavior, Matrixanalytic methods;

Management of Server Farms: capacity provisioning, dynamic power management, routing policies;

Analysis of Scheduling: FCFS, non-preemptive priorities, preemptive priorities, PS, LCFS, FB, SJF, PSJF, SRPT, etc

Mor Harchol-Balter, *Performance Modeling and Design of Computer Systems: Queueing Theory in Action*, Cambridge University Press.

A. Papoulis and S. U. Pillai, *Probability, Random Variables, and Stochastic Processes*, McGraw-Hill.

A. Leon-Garcia, *Probability and Random Processes for Electrical Engineering*, Prentice Hall.

Michael Pinedo, *Scheduling Theory, Algorithms, and Systems*, Prentice Hall.



NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL  
DEPARTMENT OF PHYSICS

Proceedings of the DPGC meeting held on 15-03-2019 at 2.00pm in the Physics Department.

Elective

**Quantum Computation PH870 (3-0-0)3**

**Classical models of computation:** Boolean logic, binary gates, computational complexity, models of classical computers, universal classical computers - Turing machines, unsolvability of most complex problems using classical computers


**Quantum computation:** Feynman's argument, relationship between physical models and computation, qubits as "quantum bits" - 2 state systems, unitary gates and operators, no-cloning theorem, entanglement as a computational resource, elementary quantum gates - Hadamard, Phase, Bit flip, CNOT, quantum algorithms - Grover's search algorithm, Shor's factorization algorithm. universal quantum computation - quantum Turing machines. Quantum error correction. Introduction to software packages for quantum computation - QuTiP, Qiskit.

**Advanced Topics:** Fault-tolerant quantum computation. Density matrices and Kraus representation theorem. POVMs and Measurement Theory. Quantum gravity and quantum computation

**Implementation of quantum algorithms**

**Resources:**

1. Nielsen and Chuang - Quantum Information and Quantum Computation (main text), Cambridge University Press; 10th Anniversary Edition, 702 pages
2. John Preskill - Lecture Notes on Quantum Computation,  
<http://www.theory.caltech.edu/~preskill/ph219/index.html#lecture>
3. Julia Kempe - Approaches to quantum error correction (arXiv:quant-ph/0612185), Séminaire Poincaré 2 (2005)

  
Dr. H.S. Nagaraja  
ASSOCIATE PROFESSOR & HEAD  
Physics Department  
NITK Surathkal, Mangalore- 575025  
KARNATAKA

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Remotely operated vehicles(ROV) systems - ROV operational techniques, data collection using echo sounding- Single and multibeam techniques, hydroacoustics, underwater inspection & investigation and health inspection of submerged marine structures.

UAV technology applications for 3D aerial coastal terrain mapping, coastal processes and monitoring the performance of marine structures.

Numerical modelling of deterioration and functionality assessment of marine structures using open source software, mesh generation, post-processing techniques

#### Reference

1. Robert D Christ , Robert L. WernliSr (2013), The ROV Manual: A User Guide for Remotely Operated Vehicles Hardcover - 2<sup>nd</sup> Edition
2. Paul Fahlstrom , Thomas Gleason (2012), Introduction to UAV Systems,Wiley, 4th Edition
3. Valavanis, K., Vachtsevanos, George J. (2015) Handbook of Unmanned Aerial Vehicles, Springer International Publishing.
4. Anderson, John D., Jr Computational Fluid Dynamics: The Basics with Applications 1st ed., McGraw-Hill, New York, 2012.
5. Griebel M., Dornseifer T., Neunhoeffler T. (1998), *Numerical Simulation in Fluid Dynamics, a Practical Introduction*, SIAM.
6. Ferziger J.H., Peric M. (2002), *Computational Methods for Fluid Dynamics*, Springer.
7. Osher S., Fedkiw R. (2002), *Level Set Methods and Dynamic Implicit Surfaces*, Springer.
8. Shu C.W. (1999), *High-Order ENO and WENO Schemes for Computational Fluid Dynamics*, in "High-Order Methods for Computational Physics", Lecture Notes in Computational Science and Engineering Vol. 9, Springer.
9. Barrett R., Berry M., Chan T.F., Demmel J., Donato J., Dongarra J., Eijkhout V., Pozo R., Romine C., Van der Vorst H. (1994), *Templates for the Solution of Linear Systems: Building Blocks for Iterative Methods*, SIAM.
10. MacDonald, N., Minty E., Malard J., Harding T., Brown S., Anonioletti M., *Writing Message Passing Parallel Programs with MPI*, Course Notes, Edinburgh Parallel Computing Center.
11. Kamath, A. (2015). "CFD based Investigation of Wave-Structure Interaction and Hydrodynamics of an Oscillating Water Column Device" Doctoral theses, 2015:326, NTNU, Trondheim, Norway.



**Course Details:**

Course Title : **Soft-switching Power Converters**  
Course Code : **PS871**  
(L-T-P) Credits : **(3-0-0)3**  
Course category : **Elective Courses (Ele)**

Addition of Course requested by: **Dr. Nagendrappa H.**

**Syllabus:**

Introduction to soft switching power conversion. Resonant converter topologies. Variable frequency and fixed frequency control. Zero-voltage and zero-current switching operation. Steady state and transient analysis of resonant converters. Zero-voltage and zero-current transition converters-Basic principle of operation and steady-state analysis. DC link commutated resonant converters.

**Text Book:**

1. M. K. Kazimierczuk and D. Czarkowski, "Resonant Power Converters", John Wiley & Sons, Second Edition, 2010.

**References:**

- i. Selected research papers from journals and conference records of *IEEE*.
- ii. Ned Mohan, T. M. Undeland, W. P. Robbins, Power Electronics, 3<sup>rd</sup> edition, John Wiley.
- iii. M. H. Rashid, Power Electronics, 4<sup>th</sup> edition, PHI (EEE)/Pearson Education.
- iv. K. Kit Sum (Editor), "Recent Developments in Resonant Power Conversion", Intertec Communications Press, California, 1988.

**Pre-requisite:**

Basic course in power electronics.

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### **Course Details:**

Course Title : **Soft-switching Power Converters Laboratory**  
Course Code : **PS872**  
(L-T-P) Credits : **(0-0-3)2**  
Course category : **Elective Courses (Ele)**

Addition of Laboratory course requested by: **Dr. Nagendrappa H.**

### **Syllabus:**

Design and performance verification of soft-switching converters studied in course PS871 through simulations/experiments.

### **Text Book:**

1. M. K. Kazimierczuk and D. Czarkowski, "Resonant Power Converters", John Wiley & Sons, Second Edition, 2010.

### **References:**

- i. Selected research papers from journals and conference records of *IEEE*.
- ii. Ned Mohan, T. M. Undeland, W. P. Robbins, Power Electronics, 3<sup>rd</sup> edition, John Wiley.
- iii. M. H. Rashid, Power Electronics, 4<sup>th</sup> edition, PHI (EEE)/Pearson Education.
- iv. K. Kit Sum (Editor), "Recent Developments in Resonant Power Conversion", Intertec Communications Press, California, 1988.

### **Pre-requisite:**

Basic course in power electronics. Knowledge of MATLAB/PSIM simulation software is desirable.



SN45) Foundation Course on Entrepreneurship (3-0-0)

Self Discovery; Opportunity discovery, Customer and Solution – understanding who is the customer, identify job, pains, gains and early adopters, Establish your venture's unique value proposition and competitive advantage; Basics of business models and lean canvas; Validation – refine value proposition with blue ocean strategy, build solution demo, prototype development; Understanding cost structures, bootstrapping and initial financing; Positioning and branding. Sales plan using funnel approach; Support – Project management, operating a business.

*Books for Reference:*

*Books for Reference:*

Mariotti, Steve. *The Young Entrepreneur's Guide to Starting and Running a Business*. New York NY: Random House, Inc. 2000.

Osterwalder Alexander, Business Model Generation, Wiley India Pvt. Ltd., 2017.

Entrepreneurship Development and Management – EDI Ahmedabad.  
Vasant Desai, Dynamics of Entrepreneurship

Vasant Desai, Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, 2000.

SM459 Advanced Course on Entrepreneurship (3-0-0)3

Pivoting – evaluating different business models, analyze competitors, product management; Business planning – yearly sales, people and financial plan; Growth strategy – scaling customers, revenue and sources of funding; Team building ; Branding and channel strategy - Understand and examine different channels ; Leveraging technology – Identifying technology needs and choosing key technologies, technology as a competitive advantage; Measuring progress – establishing key metrics and measuring; Legal – Incorporating, regulations.

*Books for Reference:*

John R. Bessant, Joe Tidd, *Entrepreneurship*, Wiley, 2018  
Beverly Rudkin, *Ingledew's Third*


Beverly Rudkin Ingle Design Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work 1st ed. Edition, Wiley, 2018

Value Proposition Design, Osterwalder Alex, Wiley india Pvt. Ltd.

Department \_\_\_\_\_ Faculty \_\_\_\_\_ Signatures! \_\_\_\_\_



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## NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

Vadapalli, R., *Mergers acquisitions and Business valuation*, Excel books, 1/e 2007  
 Damodaran, A., *Corporate Finance-Theory And Practice*, John Wiley & Sons

### MBA8G10 Services Management

(3-0-0) 3

Introduction to service operations - nature of services, strategy and positioning - designing service operations - technology and its impact on services - design and development of services and service delivery systems - work measurement, locating facilities, designing their layout - managing service operations - capacity planning and waiting line management (queuing) - managing capacity and demand - improving service processes - use of tools for process improvement - project presentations  
 James A. Fitzsimmons, Mona J. Fitzsimmon, *Service Management*, Tata McGraw Hill

### MBA8G11 Supply Chain Management

(3-0-0) 3

Supply chain - objectives - importance - decision phases - process view - competitive and supply chain strategies - achieving strategic fit - supply chain drivers - factors influencing distribution - distribution networks in practice - network design in the supply chain - supplier scoring and assessment - procurement process-sourcing planning and analysis - CRM - internal supply chain management - supplier relationship management - Bullwhip effect - obstacle to coordination - building partnerships and trust - collaborative planning, forecasting and replenishment - logistics interfaces with other areas - approaches to analyzing logistics systems - channels of distribution, cases in supply chain management.

Sumit Chopra and Peter Meindl, *Supply Chain Management: Strategy, Planning and Operation*, Pearson/PHI, 3rd Edition 2007  
 Donald J. Bowersox, D J Closs, M B Coluper, *Supply Chain Logistics Management*, TMH, Second Edition, 2008  
 Wisner, K Leong and Keah - C Tan- *Principles of Supply Chain Management: A Balanced Approach*, Thomson Press, 2005

### SM 860 Data Analytics : Business Decision Making

#### MBA8G12 Econometrics Theory and Applications

(3-0-0) 3

Econometrics as a tool for Economic and Managerial Analysis - Modeling, Data and Methodology  
 The Classical Multiple Linear Regression Model -Least Squares Regression, Goodness of Fit and Analysis of Variance, Hypothesis Testing, Multicollinearity, Heteroscedasticity and Autocorrelation  
 Qualitative Response Regression Models - Logit, Probit and Tobit Models  
 Panel Data Regression Models -Estimation of Fixed and Random Effects Models  
 Endogeneity and Instrumental Variable (IV) Model

Gujarati, Damodar N. (2003), *Basic Econometrics*, Fourth Edition, McGraw - Hill Higher Education  
 Wooldridge, J. (2002), *Econometric Analysis of Cross section and Panel data*, MIT Press  
 Wooldridge, J. (2013), *Introductory Econometrics: A Modern Approach*, 5th Edition, South-Western Cengage Learning

### HU 800 Research Methodology

(1-1-0) 2

Nature of science, Human Inquiry and Science, Learning and creativity, Innovation and creativity, Nature of Research, Research Ideas and problems, Critically Reviewing the Literature and Literature Map, Identifying research gaps, Framing research questions, Research objectives, Ethics in Research, Research approaches, process, strategies, Research Design: Conceptualization, Operationalization and Measurement, Sampling: Probability and Non-Probability, Using Primary and Secondary Data, Quantitative and Qualitative data, Data collection, Exploring and Examining, Analysis and interpretation; Communicating research findings: Written, oral, visual; Referencing.  
 William M.K. Trochim, *Research Methods*, Biztantra publications, 2<sup>nd</sup> Edition.  
 John W. Creswell, *Research Design, Qualitative, Quantitative and Mixed Approaches*, 2<sup>nd</sup> Edition, Sage Publication, 2003.

Earl Babbie, *The Basic of Social Research*, Wadsworth- Thomson Learning, 2<sup>nd</sup> Edition, 2002.  
 E. M. Phillips And D. S. Pugh, *How To Get A PhD -A Handbook for PhD Students and their supervisors*, Viva Books 2006  
 Antony Wilson, Jane Gregory, Steve Miller, Shirley Earl, *Handbook of Science Communication*, Overseas Press India Pvt Ltd, 2005

Donald R. Cooper, Pamela S. Schindler, *Business Research Methods*, TMH, New Delhi, 2006.  
 Juri Neimark, *Mathematical Models in Natural Sciences and Engineering*, Springer, 2003.  
 Rutherford Aris, *Mathematical Modeling Techniques*, Dover Publications, New York, 1994.  
 J N Kapur, *Mathematical Modeling* New Age Publishers, New Delhi, 1988.  
 T. Roscoe, *Writing Reviews for Systems Conferences*, <http://people.inf.ethz.ch/roscoe/pubs/review-writing.pdf>.  
 H. Schulzrinne, *Writing Technical Articles*, <http://www.cs.columbia.edu/hgs/etc/writing-style.html>.  
 G.M. Whitesides, *Writing a Paper*, <http://www.che.iitm.ac.in/misc/dd/writepaper.pdf>.

(Dr. Pradyot R. Jena)

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**Department of Mechanical Engineering****Minutes of DPGC meeting held on 19/03/2019****Time:** 12 Noon**Venue:** Faculty Meeting Hall

**Agenda:** To discuss about proposals for new M.Tech courses and modifications to existing M.Tech courses.

**Meeting Minutes:** DPGC recommends the below proposal for modification of course existing in the PG Academic Curriculum-2018.

Existing course detail	Modification
Course code: ME-715 Course Name: Applications of Numerical Methods in Design Credits: (3-0-0) 3	Course code: ME-715 Course Name: Applications of FEM in Design Credits: (3-0-0) 3

  
Secretary, DPGC

  
Chairman, DPGC



## LIST OF MINOR SUBJECTS OFFERED BY DEPARTMENT OF CHEMISTRY

For Odd semester**CY804 : Spectroscopy, Applications in Chemistry****(3-0-0) 3**

Electronic transitions, spectra of conjugated systems, complexes. Woodward-Fieser rules, H-bonding & solvent effects. IR spectroscopy: fingerprint region, functional group analysis, H-bonding & solvent effects, overtones, Fermi resonance, analysis of organic & coordination compounds. Raman spectroscopy and its applications. NMR spectroscopy:  $^1\text{H}$  NMR, Zeeman splitting,  $\delta$ , spin-spin coupling, Instrumentation & experimental techniques. J values, 1<sup>st</sup> & 2<sup>nd</sup> order patterns. AB, AX & ABX systems, stereo chemical assignments. 2D NMR, MRI.  $^{13}\text{C}$  NMR: Theory & applications. NMR of B, Al, Si, F & P nuclei-structure and dynamics of inorganic molecules. ESR spectra of organic free radicals, metal complexes, spin traps. NQR spectroscopy: Townes-Dailey theory, techniques, instrumentation, applications. Mass spectroscopy: Instrumentation, molecular ions, meta-stable, isotope abundance, fragmentation types & rules. McLafferty rearrangement, ESI-MS & MALDI-MS. Single crystal X-ray analysis.

*Silverstein, Bassler & Morrill, Spectrometric Identification of Organic Compounds, Wiley, 1981.*

*W. Kemp, Organic Spectroscopy-3<sup>rd</sup> Ed. Pargrave Publishers, New York, 1991.*

*P. S. Kalsi, Spectroscopy of Organic Compounds-3<sup>rd</sup> Ed. New Age, New Delhi, 2000.*

*J. A. Iggo: NMR Spectroscopy in Inorganic Chemistry, Oxford University Press, 1999.*

**CY703 : Organic Chemistry-I****(3-0-0) 3**

Basic concepts: Review of inductive, electromeric, resonance, hyperconjugative and field effects, tautomerism. H-bonding, EDA complexes, inclusion compounds, Crown ethers, Catenanes, Rotaxanes. Hammett & Taft equations. Aromaticity: Huckel's rule, Organic acids and bases, factors affecting. Reaction mechanisms, structure and reactivity, organic reactions & reagents. Kinetic and thermodynamic control, transition states, Hammond postulate, kinetic isotope effect. Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, nitrenes, carbenes, benzynes. Determination of reaction mechanism. Aliphatic/aromatic nucleophilic, electrophilic, substitution reactions, types & mechanisms, Additions to C-C and Carbon-Heteroatom multiple bonds, Elimination reactions, Free radical reactions, Formation and hydrolysis of esters, Base catalyzed condensation reactions. Photochemistry: Jablonski diagram & quantum yield, Photochemical synthesis.

*F. A. Carey & R. I. Sundberg, Advanced Organic Chemistry, Part A and B, 3<sup>rd</sup> edition, Plenum Press, New York, 1990.*

*J. March, Advanced Organic Chemistry, Reactions, Mechanism & Structure, 4<sup>th</sup> edition, Wiley Interscience, 1994*

*R. H. Lowry and K. S. Richardson, Mechanism and Theory in Organic Chemistry, 2<sup>nd</sup> edition, Harper and Row Publishers, New York, 1981.*

*P. Sykes, A Guide book of Mechanisms in Organic Chemistry, Orient-Longman, 1985.*

**CY704 : Physical Chemistry-I****(3-0-0) 3**

Quantum Chemistry: de-Broglie concept, uncertainly principle, Schroedinger equation, Solution of Schroedinger wave equation for exactly solvable problems. Chemical Thermodynamics: Combined form of 1<sup>st</sup> and 2<sup>nd</sup> laws, Maxwell's relations. Third law of thermodynamics, Gibbs-Duhem equation Quantitative treatment of Le-Chatelier principle. Chemical Dynamics: Transition state theory and the Arrhenius equation. Marcus theory of electron transfer. Reactivity and selectivity principles. Lindemann, Hinshelwood and RRKM theories. Fast reaction Techniques, Complex reactions, Opposing, parallel, consecutive reactions. reactions in solution: Ionic reactions-kinetic salt and solvent effects. Substituent effects on the rates of reactions-Hammett and Taft equations, linear free energy relationships. Isokinetic temperature. An introduction to kinetic isotope effect. Theories of reaction rates:



Collision theory of reaction rates, steric factor, activated complex theory and its applications to reactions in solution. Phase equilibria

*A.W. Atkins Physical Chemistry ELBS (IV Edition) Oxford University Press, Oxford 1990.*

*J. Rajaram and J.C. Kuriacose, Thermodynamics for Students of Chemistry, Shobanlal Nagin Chand Co. 1986.*

*Donald A Mc Quarrie, Quantum Chemistry, University Science Books, Mill Valley, California, 1983.*

*A.K. Chandra, Introductory Quantum Chemistry (Tata McGraw Hill) 1994.*

## **For Even semester**

### **CY751 : Inorganic Chemistry–II**

**(3-0-0) 3**

s-Block elements: General discussions, synthesis and properties of their compounds. Alkali and alkaline earth metal complexation, cyclic and crown ethers, cryptands and calixerenes, biological significance. p-Block elements : Chemistry of non metals: B, Si, P & S, E-H, E-X, E-O & E-N bond types in different molecules, Chemistry of boranes, silanes, phosphanes and sulphanes, borazine, boron and silicon nitrides. P-N & S-N rings: synthesis, structure, bonding and reactions of N<sub>3</sub>P<sub>3</sub>Cl<sub>6</sub> & S<sub>4</sub>N<sub>4</sub>. Halogen and noble gas chemistry: Inter halogens, pseudo halogens, ionic oxyhalogen species. Organometallics of s-and p-block elements Specific reagents of main group elements: synthesis, structure and reactions Industrial Chemicals: Urea and poly phosphates, production, structure, property, analysis and uses.

*F.A.Cotton and G. Wilkinson, Advanced Inorganic Chemistry, 6th edn., J. Wiley. New York, 1999.*

*D.F.Shriver, P.W. Atkins and C.H. Lingford, Inorganic Chemistry, ELBS, 1990*

*W.L. Jolly, Modern Inorganic Chemistry, McGraw-Hill, 1985.*

*N.N.Greenwood and E.A. Earnshaw, Chemistry of Elements, Pergmann Press, 1984.*

### **CY754 : Spectroscopy**

**(3-0-0) 3**

Atomic and Molecular Spectroscopy: Interaction of electromagnetic radiation with matter, absorption and emission spectroscopy, molecular spectra, quantization of energy levels and transitions. Microwave-Spectroscopy: Spectra of diatomic & polyatomic molecules, rigid and non-rigid rotator models, isotope effects, Stark effect, instrumentation. IR spectroscopy: Vibrational frequency, modes of vibration, instrumentation, FTIR. Raman spectroscopy: Basic principles, Raman Spectroscopy. Electron transition spectroscopy: Beer-Lambert's law, chromophores, oxochromes, instrumentation. Molecular luminescence spectroscopy, Chemiluminescence, Fluorescence, and phosphorescence, Atomic absorption spectroscopy. X-ray diffraction techniques: X-ray structural analysis.

*D. A. Skoog and D. M. West, Instrumental methods of Analysis, Holt Rinehart Winston, New York, 1988.*

*C. N. Banwell and E. M. McCash, Fundamentals of Molecular Spectroscopy, Tata-McGraw Hill, 1994.*

*Barrow, Introduction to Molecular Spectroscopy.*

*Drago, Physical Methods in Inorganic Methods.*

## Proceedings of the Combined DUGC/ DPGC/ DRPC meeting of the Department of Civil Engineering, NITK

Venue: New Seminar Hall, CED

Date: 18<sup>th</sup> March 2019

### Agenda:

Discussions on items to be placed for the Forthcoming BoS Meeting on 26<sup>th</sup> March 2019

1. M.Tech (Environmental Engineering) Introduction of New Elective  
CV880: Environment and Climate Change (3-0-0)3
2. M.Tech (Geotechnical Engineering) – Introduction of New Elective  
CV830: Geo-Disaster Mitigation (3-0-0)3
3. B. Tech (Civil Engineering) – Introduction of New Elective:  
CV491: Bituminous Materials, Mixtures, and Pavements (3-0-0) 3
4. B. Tech (Civil Engineering) – Other Minor Changes Proposed

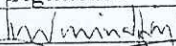
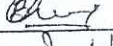
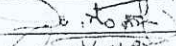
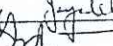
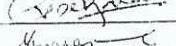
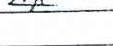
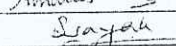
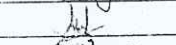

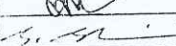
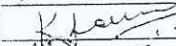
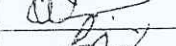
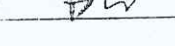


Switching of an Elective Course to Core Course based on demand from B.Tech Students  
MA207: Numerical Methods (3-0-0) 3

Switching & Re-designation of a Core Course to Elective in order to accommodate MA207 as a Core to maintain the existing credit structure.

Existing CV300: Structural Analysis II as CV300: Analysis of Indeterminate Structures (3-0-0)3

Re-naming an existing Core Course in order to accommodate MA207 as a Core Course.  
Existing CV250: Structural Analysis I as CV250: Structural Analysis (3-0-0)3

Mutual shifting of a few subjects from higher semesters to lower semesters and vice-versa in order to provide exposure to fundamental courses to students in Civil Engineering in the lower semesters so that they can take up specialized Elective courses in the higher semesters.

Sl. No.	Names of Faculty	Signature	Sl. No.	Names of Faculty	Signature
1	Dr. K. SWAMINATHAN		13	Baboo Choudhary	
2	G. Mahesh		14	Jayalakshmi. B R	
3	C. Rajasekaran		15	Adani AZHON	
4	M. C. Narasimhan				
5	Sitaram Nayak				
6	SURESH C. N.				
7	Vijayaraj Gey				
8	A. S. Balu				
9	S. Shrikani				
10	K. N. Lokesh				
11	PALANISAMY. T				
12	R. Shivarantan				



# NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

## Department of Civil Engineering (CV): Bachelor of Technology in Civil Engineering

Basic Science Core (BSC)- 16 Credits		
MA110	Engineering Mathematics - I	(3-0-0)3
PH110	Physics	(3-1-0)4
PH111	Physics Lab	(0-0-2)1
MA111	Engineering Mathematics - II	(3-0-0)3
CY110	Chemistry	(3-0-0)3
CY111	Chemistry Lab	(0-0-3)2
Engineering Science Core (ESC) - 17 Credits		
EC110	Elements of Electronics and Communication Engineering	(2-0-0)2
AM110	Engineering Mechanics	(3-0-0)3
ME110	Elements of Mechanical Engineering	(2-0-0)2
ME111	Engineering Graphics	(1-0-3)3
EE110	Elements of Electrical Engineering	(2-0-0)2
CS100	Computer Programming	(3-1-0)4
CS111	Computer Programming Lab	(0-0-2)1
Humanities and Social Science Core (HSC)- 9 Credits		
SM110	Professional Communication	(3-0-0)3
SM300	Engineering Economics	(3-0-0)3
SM302	Principles of Management	(3-0-0)3
Programme Core (PC)- 65 Credits		
AM200	Mechanics of Materials	(3-0-0)3
AM216	Strength of Materials Lab	(0-0-3)2
AM250	Mechanics of Fluids	(3-0-0)3
AM300	Water Resources Engineering	(3-0-0)3
AM316	Hydraulics Lab	(0-0-3)2
CV100	Civil Engineering Materials and Construction	(3-1-0)4
CV201	Elements of Surveying	(3-0-0)3
CV202	Engineering Geology	(3-0-0)3
CV216	Civil Engineering Materials Lab.	(0-0-3)2
CV217	Surveying Practice	(0-0-3)2
CV250	Structural Analysis	(3-0-0)3
CV251	Design of RCC Structures	(3-0-0)3
CV252	Soil Mechanics	(3-0-0)3
CV266	Geology Lab	(0-0-3)2
CV267	Soil Mechanics Lab	(0-0-3)2
CV301	Highway and Traffic Engineering	(3-0-0)3
CV316	Building Design and Drawing	(1-0-3)3
CV350	Environmental Engineering	(3-0-0)3
CV351	Design of Steel Structures	(3-0-0)3
CV366	Environmental Engineering Lab	(0-0-3)2
CV367	Highway Materials and Concrete Testing Lab	(0-0-3)2
CV400	Estimation Costing and Specifications	(3-0-0)3
CV417	Structural Design and Drawing	(1-0-3)3
MA207	Numerical Methods	(3-0-0)3
Programme Specific Electives (PSE)		
CV253	Architecture and Town Planning	(3-0-0)3
CV268	Advanced Mining Geology	(3-0-0)3
CV300	Analysis of Indeterminate Structures	(3-0-0)3
CV321	Applied Soil Engineering	(3-0-0)3
CV322	Concrete Technology	(3-0-0)3
CV371	Railways, Tunnels, Harbours and Airports	(3-0-0)3
CV372	Design of PSC Structures	(3-0-0)3
CV373	Probability Methods in Civil Engineering	(3-0-0)3
CV385	Geoinformatics	(3-0-0)3
CV386	Rock Mechanics	(3-0-0)3

CV387	Applied Geology	(3-0-0)3
CV388	Advanced Surveying	(3-0-2)4
CV389	Advanced Structural Analysis	(3-0-0)3
CV401	Bridge Engineering	(3-0-0)3
CV422	Advanced Design of Structures - I	(3-0-0)3
CV423	Design of Foundations, Earth and Earth Retaining Structures	(3-0-0)3
CV424	Advanced Environmental Engineering	(3-0-0)3
CV425	Computer Aided Design and Applications in Civil Engineering	(2-0-3)4
CV426	Solid Waste Management	(3-0-0)3
CV438	Structural Dynamics and Wind Engineering	(3-0-0)3
CV471	Advanced Design of Structures - II	(3-0-0)3
CV472	Ground Improvement Techniques	(3-0-0)3
CV473	FEM Applications in Civil Engineering	(3-0-0)3
CV474	Elements of Earthquake Engineering	(3-0-0)3
CV475	Oil and Natural Gas Exploration	(3-0-0)3
CV476	Disaster Management and Mitigation	(3-0-0)3
CV477	Seismoresistant Concrete Structures	(3-0-0)3
CV485	Air Pollution and Noise Pollution	(3-0-0)3
CV486	Environmental Impact Assessment	(3-0-0)3
CV487	Construction and Project Management	(3-0-0)3
CV488	Groundwater Development and Management	(3-0-0)3
CV489	Retrofitting and Rehabilitation of Structures	(3-0-0)3
CV490	Non-destructive testing & evaluation for concrete structures	(3-0-0)3
AM371	Open Channel Flow and Sediment transport	(3-0-0)3
AM372	Civil Engineering Systems	(3-0-0)3
AM400	Geographic Information Systems	(3-0-0)3
AM401	Satellite Digital Image Analysis	(3-0-0)3
AM402	Introduction to Geospatial Technologies and Applications	(3-0-0)3
AM403	Global Positioning Systems	(3-0-0)3
AM421	Design and Drawing of Hydraulic Structures	(1-0-3)3
AM422	Fundamentals of Coastal Engineering	(3-0-0)3
AM423	Basics of Offshore Engineering	(3-0-0)3
AM424	Coastal Erosion and its Mitigation	(3-0-0)3
AM445	Fundamentals of Finite Element Method	(3-0-0)3
AM455	Engineering Optimization	(3-0-0)3
AM473	Water Resources Excess Management	(3-0-0)3
AM474	Computational Methods in Hydrology	(3-0-0)3
AM475	Ground Water Engineering	(3-0-0)3
AM477	Open Source Virtual Instrumentation	(2-0-2)3
AM478	Theory of Isotropic Elasticity	(3-0-0)3
AM380	Mini Project-I	(0-0-3)2
AM381	Mini Project-II	(0-0-3)2
CV380	Mini Project-I	(0-0-3)2
CV381	Mini Project-II	(0-0-3)2
Major (MP)- 6 Credits		
CV449	Major Project - I	(0-0-3)2
CV499	Major Project - II	(0-0-6)4
Mandatory Learning Courses (MLC) - 5 Credits		
CV110	Environmental Studies	(1-0-0)1
SM111	Professional Ethics and Human Values	(1-0-0)1
CV390	Seminar	(0-0-2)1
CV440	Practical Training	(0-0-3)2



# NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

## Suggested Plan of Study

Number of Courses	Semester							
	I	II	III	IV	V	VI	VII	VIII
1	MA110	MA111	CV201	CV250	CV316	CV351	CV400	CV499
2	PH110	CY110	CV202	CV251	CV350	CV366	CV417	Elective
3	PH111	CY111	CV216	CV252	SM302	CV367	CV440	Elective
4	EC110	CS110	AM200	CV217	Elective	SM300	CV449	
5	EE110	CS111	AM216	CV266	Elective	CV390	Elective	
6	ME110	AM110	AM250	CV267	Elective	Elective	Elective	
7	ME111	CV100	AM316	CV301	Elective	Elective	Elective	
8	SM110	CV110	MA207	AM300	Mini Project*	Elective	Elective	
9	SM111					Mini Project*		

\* Mini Project courses (Optional) will be offered in V and VI semesters only

## Degree Requirements:

Category of Courses	Minimum Credits to be Earned
<u>Foundation Courses</u>	16
Basic Science Core (BSC)	17
Engineering Science Core (ESC)	09
Humanities and Social Science Core (HSC)	Total 42
Programme Core (PC)	65
<u>Electives</u>	39
Programme Specific Electives (PSE) and Open Electives	
<u>Project (MP)</u>	6
Major Project	0 - 4
Minor Project	
Mandatory Learning Courses (MLC)	5
Total	157



Courses Offered for B.Tech Minor Degree in Civil Engineering (Any five can be selected by the student):

Semester	Course Code	Course	Credits
III	AM200	Mechanics of Materials	(3-0-0)3
	CV201	Elements of Surveying	(3-0-0)3
IV	CV252	Soil Mechanics	(3-0-0)3
V	CV350	Environmental Engineering	(3-0-0)3
VI	CV301	Highway and Traffic Engineering	(3-0-0)3
VII	CV400	Estimation, Costing and Specification	(3-0-0)3

### Courses Offered for B.Tech Honors Degree in Civil Engineering:

As part of this B.Tech Honors programme, the Department of Civil Engineering proposes that the student is required to earn additional credits by registering for any five designated core courses of M.Tech Level to be offered in the E-slots for the 5<sup>th</sup>, 6<sup>th</sup>, and 7<sup>th</sup> semester B.Tech based on the recommendations of the DFC from time to time in the Department of Civil Engineering, and the Department of Applied Mechanics and Hydraulics. Such courses will not be offered at the 3<sup>rd</sup> and 4<sup>th</sup> semesters due to prerequisites of the courses. See explanation given below:

- In B.Tech fifth Semester, the students registering for Honors are required to select 2 subjects from a set of 5 designated core PG Subjects.
- Similarly, in B.Tech sixth Semester, the students registering for Honors are required to select 2 subjects from another set of 5 designated core PG Subjects.
- Also, in B.Tech seventh Semester, the students registering for Honors are required to select 1 subject from another set of 5 designated core PG Subjects.

CV250 STRUCTURAL ANALYSIS (3-0-0) 3

(Previously named: CV250: Structural Analysis I)

Conditions of equilibrium, degrees of freedom, determinate and indeterminate structures, Linear and non-linear structural systems. Deflection of beams: Moment area method and conjugate beam method, the first theorem of Castigliano, Betti's law, Clark Maxwell's Theorem of reciprocal deflection, strain energy method and unit load method. Redundant Structures: The second theorem of Castigliano, Consistent deformation method, slope deflection method. Rolling loads and influence lines: Statically determinate beams and bridge trusses, series of loads and uniformly distributed loads, criteria for maximum and absolute maximum moments and shears. Three-hinged arches, influence lines, Cables and suspension bridges, suspension bridge with three hinged stiffening girders and influence line diagrams.  
Norris and Wilber, Elementary structural analysis.  
C.K. Wang, Statically indeterminate structures

CV300 ANALYSIS OF INDETERMINATE STRUCTURES (3-0-0) 3

(Previously named: CV300: Structural Analysis II)

Analysis of statically indeterminate Structures, Moment distribution Method, Kani's Method, Matrix method: introduction to flexibility and stiffness methods, two hinged arches, influence lines for indeterminate beams and arches, analysis of multistorey frames by approximate methods, substitute frame, portal and cantilever methods, plastic analysis of simple beams and portal frames.  
S.P. Timoshenko, Theory of structures  
M.B. Kanchi, Matrix method of structural analysis



90 DC ✓  
Date 13/12/2018  
DEPARTMENT OF CIVIL ENGINEERING  
NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL  
P.O. SRINIVASNAGAR, MANGALORE - 575 025.

Date: 13.12.2018

From,  
The Office of the Head of the Department  
Department of Civil Engineering  
N.I.T.K., Surathkal.

To,  
The Head of the Department,  
Department of MACS  
NITK, Surathkal.

Dear Sir,

Sub: Request to offer a Core Course MA 207 for III Semester Civil

The Department of Civil Engineering has resolved to request the Department of MACS to offer a course MA 207 (Numerical Methods) for two sections of III Semester B. Tech. Civil Engineering (It is presently being offered as an elective course).

We would be very much obliged if you would kindly consider the above request for 2019 Batch onwards. Hence the classes may have to be engaged for III Semester B Tech. Civil only from 2020 onwards.

Thanking you,

Yours Faithfully,

(Varghese George)  
PROF. AND HEAD,

Department of Civil Engineering,  
National Institute of Technology Karnataka,  
Surathkal, Mangalore.

13/12/2018  
willing to take the  
Course MA 207 for  
the Civil Dept B Tech  
Batch from 2019 batch  
onwards. This may please be  
included in the Batch (Civil) Curriculum  
HEAD OF THE DEPT  
DEPARTMENT OF MATHEMATICAL AND  
COMPUTATIONAL SCIENCES  
NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA

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Page 05

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL  
INTER-OFFICE COMMUNICATION (IOC)

IOC No: SOM/NITK/2019/ 256		Date: 25/03/2019	
Priority – Level		Initiator's Expectation	
1) Urgent 2) Normal		1) Approval                      2) Decision                      3) Action 4) Suggestion sought      5) Information sought      6) Information conveyed	
From (Initiator)	Routed-Thru	To (Respondent)	Copies to
The Head SOM NITK, Surathkal	The Dean (Academic) NITK, Surathkal	The Director NITK, Surathkal	--
Subject: Minor in Management – reg.			


### Note from the Initiator

DFC of School of Management has resolved to offer the below mentioned course as part of Minor in Management.

Sl. No.	Code	Course Title	Credits
1	SM 722	Marketing Management	(3-0-0)3
2	SM 723	Entrepreneurship	(3-0-0)3
3	SM 725	Financial Management	(3-0-0)3
4	SM 726	Human Resource Management	(3-0-0)3
5	SM 727	Business Analytics and Decision Making	(3-0-0)3

Thank you

Yours sincerely

Yours sincerely  
  
(S. Pavan Kumar)  
Assoc. Professor & Head  
School of Management

→ BOS

Dr. S. PAVAN KUMAR

Head, School of Management

National Institute of Technology Karnataka  
Post Srinivasnagar, Surathkal, D.K.-575025

Горелакмун В. В.