ಮಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ

**MANGALORE UNIVERSITY**

**(Accredited by NAAC with 'A' Grade)**

ಕ್ರಮಾಂಕ/ No. : MU/ACC/CBCS-PG/2017-18/A2

ಕುಲಸಚಿವರ ಕಛೇರಿ
ಮಂಗಳಗಂಗೋತ್ರಿ – 574 199
Office of the Registrar
Mangalagangothri – 574 199

ದಿನಾಂಕ/Date: 17.06.2017

# NOTIFICATION

Sub: Changes in the contents of papers ELH 453, ELH 503 & ELS 504 and inclusion of paper ELS 410 in the Syllabus of M.Sc. in Electronics degree programme.

Ref: 1) This Office Notification No.: MU/ ACC/ CR.7/ CRCS-PG(SLB)/ 2016-17/ A2, dated 17.08.2016
2) Approval of the Academic Council at its meeting held on 3.02.2017 vide Agenda No.3:12 (2016-17)

~~~~

The P.G. Board of Studies in Electronics at its meeting held on 24.09.2016 has changed a few contents of courses **ELH 453, ELH 503, ELS 504** and included the soft-core course **ELS 410** in M.Sc. in Electronics degree programme.

The Academic Council at its meeting held on 3.02.2017 has approved the Syllabus of changed courses which is hereby notified for implementation with effect from the academic year 2017-18.

REGISTRAR.

To:

1) The Chairman/ Co-ordinator/ Principal of the Department/ Programme/ College concerned.
2) The Registrar (Evaluation), Mangalore University.
3) The Chairman, P.G. BOS in Electronics, Mangalore University.
4) The Superintendent (ACC), O/o the Registrar, Mangalore University.
5) Guard File.
~~~~

## MSc Electronics CBCS Course Structure

### 1 Semester

**Hard Core**

| Sl. No. | Course | Credits |
|---|---|---|
| 1 | ELH 401- Solid State Electronics | 4 |
| 2 | ELH 402- Digital System Design with Verilog HDL | 3 |
| 3 | ELH 403 - Microcontrollers | 3 |

**Soft Core**

| Sl. No. | Course | Credits |
|---|---|---|
| 1 | ELS 404 - Microprocessors | 4 |
| 2 | ELS 405 - Programming in C | |
| 3 | ELS 406 - Embedded System | 4 |
| 4 | ELS 407 - Linux shell Programming | |
| 5 | ELS 410 - Analog Devices and Circuits | |

| | | |
|---|---|---|
| 5 | ELP 408 - Digital System Design with Verilog HDL Practical | 2 |
| 6 | ELP 409 – Microcontrollers Practical | 2 |

### II Semester

**Hard Core**

| Sl. No. | Course | Credits |
|---|---|---|
| 1 | ELH 451 - Analog and Digital Communication | 3 |
| 2 | ELH 452 - Digital Signal Processing | 3 |
| 3 | ELH 453 - Basic VLSI Design | 4 |

**Soft Core**

| Sl. No. | Course | Credits |
|---|---|---|
| 1 | ELS 454 - Embedded System Design using PIC | 3 |
| 2 | ELS 455 - Network Analysis | |
| 3 | ELS 456 - Control System | 3 |
| 4 | ELS 457 - Power Electronics | |

| | | |
|---|---|---|
| 5 | ELP 458 - Analog and Digital Communication Practical | 2 |
| 6 | ELP 459 - Digital Signal Processing Practical | 2 |

**Open Elective**

| Sl. No. | Course | Credits |
|---|---|---|
| 1 | ELE 460 - Electronic Communication | 3 |

## III Semester

**Hard Core**

| Sl. No. | Course | Credits |
|---|---|---|
| 1 | ELH 501 – Digital Image Processing | 3 |
| 2 | ELH 502 - Low Power VLSI | 3 |
| 3 | ELH 503 - Wireless Communication System | 4 |

**Soft Core**

| Sl. No. | Course | Credits |
|---|---|---|
| 1 | ELS 504 - Nano Electronics | 3 |
| 2 | ELS 505 - Microwave Engineering | |
| 3 | ELS 506 - DSP Processor | 3 |
| 4 | ELS 507 - Speech Processing | |
| 5 | ELP 508 - Digital Image Processing Practical | 2 |
| 6 | ELP 509 - Low Power VLSI Practical | 2 |

**Open Elective**

| Sl. No. | Course | Credits |
|---|---|---|
| 1 | ELE 510 - Medical Electronics | 3 |

## IV Semester

**Hard Core**

| Sl. No. | Course | Credits |
|---|---|---|
| 1 | ELP 551 - Project | 16 |

**Soft Core**

| Sl. No. | Course | Credits |
|---|---|---|
| 1 | ELS 552 - Introduction to Arduino, Raspberrypi and Beaglebone Black | 4 |
| 2 | ELS 553 - Video Processing | |
| 3 | ELS 554 - VLSI Design using CAD | 4 |
| 4 | ELS 555 - Biomedical Electronics | |

I - Semester

ELS 410 - **Analog Devices and Circuits**

## UNIT I

**Basic Devices**: The $r_e$ transistor model – Small signal analysis of CE configuration. Comparison of the result of CE with CB and CC configurations, Hybrid parameters, analysis of voltage divider bias CE configuration using hybrid equivalent model. Frequency response (low and high) of BJT CE amplifier.

Characteristics of JFET and MOSFET –voltage divider bias – small signal analysis of JFET and MOSFET in CS configuration, Comparison of the results of CS configuration with CG and CD configuration.

**14 HOURS**

## UNIT II

**Op-Amps**: Introduction to Op-amp, internal block diagram, Characteristics of practical op-amp. Negative feedback, Op-amp with negative feedback and its effect on op-amp impedances. Bias current and offset voltage compensation, open loop and closed loop response.

**Op-amp Applications**: Comparators, Summing amplifier, Integrator, Differentiator, Isolation amplifier, Instrumentation Amplifier, Active filters (first order, second order Butterworth filters).

**14 HOURS**

## UNIT III

**BJT power amplifier circuits** – Efficiency and harmonic distortion – Class A, Class B and Class AB operation, Power transistor heat sinking.

**Other Devices**: SCR operation and its applications, UJT characteristics and its applications. Application of Triac in phase (power) control.

**14 HOURS**

**Text Books:**


1. Boylestad and Nashelsky, "Electronic devices and Circuits theory", 8th Edn. (Prentice Hall of India 2002)
2. Floyd T L "Electronic Devices", 5th Edn. (Pearson Education Asia 2002).
3. Samuel.Y.Liao, "Microwave devices and Circuits", 3rd Edn, Prentice Hall of India.


**Reference Books:**


1. R.A. Gayakwad, "Op-amps and linear integrated circuits", 3rd edn. (Prentice Hall of India 2002).
2. Sedra and Smith "Microelectronic Circuits", 4th Edn. (Oxford University Press (India))

II Semester

## ELH 453 - BASIC VLSI DESIGN

### Unit I

**12 Hours**

A Review of Microelectronics and An Introduction to MOS Technology: Introduction to Integrated Circuit Technology, The Integrated Circuit (IC), Metal-Oxide-semiconductor (MOS) and Related VLSI Technology, Basic MOS Transistors, Enhancement Mode Transistor Action Depletion Mode Transistor Action, nMOSFabr:cation, CMOS Fabrication, Thermal Aspects of Processing, BiCMOS.

### Unit II

**15 Hours**

Basic Electrical Properties of MOS and BiCMOS Circuits: Drain-to-Source Current *Ids* versus Voltage *Vds*Relationships, Aspects of MOS Transistor Threshold Voltage $V_t$, MOS Transistor Transconductance*gm*and Output Conductance *gds,* MOS Transistor Figure of Merit Wo, The Pass Transistor, The nMOS Inverter, Determination of Pull-up to Pull-down Ratio *(ZpulZp.d)* for an nMOSInverter Driven by another nMOS Inverter, Pull-up to Pull-down Ratio for an nMOS Inverter Driven throughOne or More Pass Transistors, Alternative Forms of Pull-up, The CMOS Inverter, MOS Transistor Circuit Model, Some Characteristics of npn Bipolar Transistors, Latch-up in CMOS Circuits, BiCMOS Latch-up Susceptibility.

### Unit III

**15 Hours**

MOS and BiCMOS Circuit Design Processes : MOS Layers, Stick Diagrams, Design Rules and Layout, General Observations on the Design Rules, Layout diagrams, Symbolic Diagrams.

Basic Circuit Concepts : Sheet Resistance *Rs,* Sheet Resistance Concept Applied to MOS Transistors and Inveners, Area Capacitances of Layers, Standard Unit of Capacitance Cg, Some Area Capacitance Calculations, The Delay Unit t, Inverter Delays, Driving Large Capacitive Loads, Propagation Delays, Wiring Capacitances, Choice of Layers.

Scaling of MOS Circuits: Scaling Models and Scaling Factors, Scaling Factors for Device Parameters, Some Discussion on and Limitations of Scaling, Limits Due to Sub-threshold Currents, Limits on Logic Levels and Supply Voltage Due to Noise, Limits Due to Current Density.

**TEXT BOOKS:**

2. "Basic VLSI Design," Douglas A. Pucknell& Kamran Eshraghian, PHI 3rd Edition, 2005.

Reference Books

2. "Principles of CMOS VLSI Design,"Neil H. E. Weste and K. Eshragian,2nd edition, Pearson Education (Asia) Pvt. Ltd., 2000. History of VLSI.

3. "CMOS VLSI Design,".Weste and David,3rd edition, 2011.

III - Semester

## ELH503 - Wireless Communication Systems

### UNIT I

**Introduction to Wireless Communication Systems:** Evolution of Mobile Radio Communications, Mobile Radio Systems around the world, examples of Wireless Communication Systems, Paging System, Cordless Telephone System. Cellular Telephone Systems, Comparison of Common Wireless Communications Systems.

**Modern Wireless Communications Systems:** Second generation (2G), Cellular Networks, evolution of 2.5G, TDMA Standards, Third Generation (3G) Wireless Networks, Wireless Local Loop (WLL) and LMDS, Wireless Local Area Networks (WLANs), Bluetooth and Personal Area Networks (PANS) **14 hours**

### UNIT II

**The Cellular Concept**: System Design Fundamentals, Introduction, Frequency reuse, channel assignment strategies, handoff strategies – prioritizing handoffs, Practical Handoff considerations, Interference and system capacity, co-channel interference and system capacity, channel planning for wireless systems, adjacent channel interference, power control for reducing interference

**Mobile Radio Propagation**: Introduction to radio wave propagation, Free space propagation model, Relating power to electric field, Reflection, Diffraction, Scattering. **14 hours**

### UNIT III

**Multiple Access Techniques for Wireless Communications**: Introduction to Multiple access, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Space Division Multiple Access (SDMA). Packet radio.

**Wireless Networking**: Introduction to wireless networks, Differences between wireless and fixed telephone network-PSTN network, Development of Wireless network, Fixed network transmission hierarchy, personal communication services/ networks, Wireless data services, ISDN & ATM, PRMA & UMTS **14 hours**

**Text Books:**

1. Theodore S Rappaport: Wireless Communications, Principles and Practice, 2 nd Edition, Pearson Education Asia, 2002.

**Reference Books:**

3. William C Y Lee: Mobile Communications Engineering Theory and Applications, 2nd Edition, McGraw Hill Telecommunications 1998.
4. William Stallings: Wireless Communications and Networks, Pearson Education Asia, 2002.

III Semester

# ELS 504 – NANOELECTRONICS

**Unit -I** **8 Hours**

## Nanoscience and Nanoelectronics

Introduction to Nanoscience and nanoelectronics, the top-down approach, the bottom- up approach, Miniaturization of Electrical and Electronic Devices, Moore's Law and the SIA Roadmap.

## Nanolayers

Production of Nanolayers, Physical Vapour Deposition (PVD), Chemical Vapour Deposition (CVD) Epitaxy, Ion Implantation, Formation of Silicon Oxide, Characterization of Nanolayers, Thickness, Surface Roughness, Crystallinity, Chemical Composition, Doping Properties, Optical Properties, Applications of Nanolayers, Evaluation and Future Prospects.

**Unit -II** **12 Hours**

## Nanoparticles

Fabrication of Nanoparticles, Grinding with Iron Balls, Gas Condensation Laser Ablation, Thermal and Ultrasonic Decomposition, Reduction Methods, Self-Assembly, Low-Pressure, Low-Temperature Plasma, Thermal High-Speed Spraying of Oxygen/Powder/Fuel, Atom Optics, Sol gels, Precipitation of Quantum Dots, Other Procedures, Characterization of Nanoparticles, Optical Measurements, Magnetic Measurements, Electrical Measurements, Applications of Nanoparticles, Evaluation and Future Prospects.

## Extension of Conventional Devices by Nanotechniques

MOS Transistors, Structure and Technology, Electrical Characteristics of Sub-100 nm MOS Transistors, Limitations of the Minimum Applicable Channel Length, Low-Temperature Behavior, Evaluation and Future Prospects, Bipolar Transistors, Structure and Technology, Evaluation and Future Prospects.

**Unit -III** **10 Hours**

## Innovative Electronic Devices Based on Nanostructures

General Properties, Resonant Tunneling Diode, Operating Principle and Technology, Applications in High Frequency and Digital Electronic, Circuits and Comparison with Competitive Devices, Quantum Cascade Laser, Operating Principle and Structure, Quantum Cascade Lasers in Sensing and Ultrafast Free, Space Communication Applications, Single Electron Transistor, Operating Principle, Technology, Applications, Carbon Nanotube Devices, Structure and Technology, Carbon Nanotube Transistors

1) **Nanotechnology and Nanoelectronics:** Materials, Devices, Measurement Techniques by W. R. Fahrner (Editor)