Digital Signal Processors Applications in Power Systems [DSPAPS]

B.E. Sem. VIII [ELEC] (Elective − II)

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. **Introduction:** Review of microprocessor, microcontroller and digital signal processors architecture, Fixed and floating-point processors and microcontrollers: TMS320 series family

2. **Number Representations in DSP processors:** Number formats and operations: Fixed point 16 bit Numbers representations of signed integers and fraction, Q-15 numbers and its operations. Floating Point Numbers. Assemblers and assembly language programming, Binary file formats, COFF file structure for TMS320 processor.

3. **DSP Architecture and programming:** Architectural details of TMS320VC33 and TMS320F2407 Memory map, interrupts and addressing mode, programming with assembly language and C compiler

4. **Power Electronics applications in Power systems:** Review of power electronics applications: Control applications, Active filtering, Static VAR Compensator, Electric Drives, Hardware in Loop simulations. Implementing power electronics control on digital systems. Issues of harmonics and unbalanced currents in power systems, Harmonic Extraction of current components, Implementation of Active filters in DSP under balanced and unbalanced conditions: reference frame transformation, harmonic oscillator, 3ϕ phase lock loop, oscillator synchronization

5. **Integration Methods for Real Time DSP implementation:**
   Review of numerical integration: Euler's implicit and explicit method, Heun Method, Trapezoidal Method. Implementation of low pass filter.

6. **Control Applications of DSP processor:** Generation of PWM signals, sine PWM, ADC interface; basics of implementation of converter control for renewable energy sources: Solar, wind and Fuel cell systems

Reference Books:

1. Power Electronics, Converters, Applications & Design (*N.Mohan, T.M.Undeland, W.P Robbins*) Wiley India Pvt. Ltd.
2. Modern Power Electronics and AC Drives (*B. K Bose*) Perason Education
3. Understanding FACTS (*N. G. Hingorani, & Laszlo Gyugyi*) IEEE press
4. Digital signal Processing: A practical Approach (*E. C. Ifeachor & B. W. Jervice*) Pearson Education
5. Numerical Methods for scientific and Engineering Computation (*M. K. Jain, S.R.K. Iyengar & R. K. Jain*) New Age International Publications
6. Digital Signal Processing: Principle, Algorithm, & Applications (*J.G. Proakis & D. G. Manolokis*) Pearson Education
7. TMS320VC33 processor datasheet
8. TMS320F2407 processor datasheet
9. TMS320VC33 Starter Kit manual
10. TMS320F2407 Starter Kit manual

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