Shri G. S. Institute of Technology & Science, Indore

Department of Mechanical Engineering

Date: 03th July, 2024

Minutes of BOS Meeting held on 03rd July 2024

A Board of Studies (BOS) meeting of Mechanical Engineering was held in hybrid (both offline & online) mode on 03rd July 2024 at 03:30 PM for reviewing the course structure and syllabus of UG and PG programs of the department.

Following members have attended the meeting:

1.	Dr. Sudhir Tiwari, Professor, Department of Mechanical Engineering, SGSITS, Indore	Chairman
2.	Dr. B. K. Gandhi, Professor, Department of Mechanical Engineering, IIT Roorkee	Expert Member
3.	Dr. Ashesh Tiwari, Professor, Department of Mechanical Engineering, IET DAVV Indore	Expert Member
4.	Dr. Pavan Kumar Kankar, Associate Professor, IIT-Indore	Expert Member
5.	Shri. Vidyadhar Pande, Director, ABHIKALP Design Studio, Indore	Industry Expert
6.	Prof S. Manepatil	Member
7.	Dr. M. L. Jain	Member
8.	Dr. Rajkumar Porwal	Member
9.	Dr. Basant Agrawal	Member
10.	Dr. B. R. Rawal	Member
11.	Dr. Vinod Pare	Member
12.	Dr. Bhupendra Singh More	Member
13.	Dr. Manoj Chouksey	Member
14.	Smt. Swati Chaugaonkar	Member
15.	Dr. Prabnesh Ganai	Member
16.	Dr. Ashok Atulkar	Member
17.	Shri. Dinesh Pasi	Member
18.	Shri. Vinod Parashar	Member
19.	Shri. Ravi Jatola	Member
20.	Shri Ganga Ram Mourya	Member

Meeting could not be attended by

1. Prof S. V. Modak- External Member
2. Mr. Anil Mulewa

The deliberations of the meeting are as under:

Item no.1 – Review of Scheme of B. Tech course of the department.

The committee reviewed the scheme of B Tech program in context of NEP and industry requirement and proposed the following;

1. Subject ME26562 Kinematics of Machine of IV Sem will be merged with ME36011 Dynamic of Machines of V semester and combined subject of Kinematics and Dynamics of Machines will be offered in IV Sem.
2. In place of ME36011 Dynamics of Machines of V Sem another subject Computer Aided Design will be shifted in Sem V from Sem. VII.
3. Subject Finite Element Analysis, which was earlier being offered as elective, will be a regular subject in semester VII in place of ME46020: Computer Aided Design.
4. Laboratory courses have been separated from theory courses as per NEP requirements and new codes will be required.
5. Syllabus of ME26881: Machine drawing and computer graphics has been revised. New nomenclature of the subject will be Machine Drawing.
6. Following new courses have been added in elective courses list-
   (a) Advanced Materials
   (b) Fault Diagnosis and Condition Monitoring
   (c) Product Design and Development
7. Following course of NPTEL are recommended to offer to students of 3rd and 4th year to study in online mode.

Course ID	Course Name	SME Name	Institute
noc24-me129	Introduction to Composites	Prof. Nachiketa Tewari	IIT Kanpur
noc24-me117	Industrial Robotics : Theories for Implementation	Prof. Arun Dayal Udai	IIT (ISM Dhanbad)
noc24-me102	Dynamic Behaviour of Materials	Prof. Prasenjit Khanikar	IIT Guwahati
noc24-me136	Principle of Hydraulic Machines and System Design	Prof. Pranab K. Mondal	IIT Guwahati
noc24-me138	Fundamentals of Additive Manufacturing Technologies	Prof. Sajan Kapil	IIT Guwahati
noc24-me141	Computational Fluid Dynamics	Prof. Suman Chakraborty	IIT Kharagpur
noc24-me142	Energy Conservation and Waste Heat Recovery	Prof. Prasanta Kr Das Prof. A Bhattacharya	IIT Kharagpur
noc24-me143	Experimental Modal Analysis	Prof. Subodh V. Modak	IIT Delhi

It is recommended that students successfully completing any of above courses in NPTEL platform shall be given benefit of credit transfer of elective courses during 8th semester.

All modifications from point no 1-6 are proposed to be implemented for 2023-24 admitted students. Revised scheme attached.

The meeting ended with a vote of thanks to the chair.

Signatures of BoS Members attended meeting on 3rd July 2024

1.	Dr. Sudhir Tiwari		11.	Dr. Vinod Pare	
2.	Dr. B.K. Gandhi	Online	12.	Dr. Bhupendra Singh More	
3.	Dr. Ashesh Tiwari		13.	Dr. Manoj Chouksey	
4.	Dr. Pavan Kumar Kankar	Online	14.	Smt. Swati Chaugaonkar	
5.	Shri. Vidyadhar Pande	online	15.	Dr. Prabnesh Ganai	
6.	Prof S. Manepatil		16.	Dr. Ashok Atulkar	
7.	Dr. M. L. Jain		17.	Mr. Dinesh Pasi	
8.	Dr. Rajkumar Porwal	Rajkumar	18.	Mr. Vinod Parashar	
9.	Dr. Basant Agrawal		19.	Shri. Ravi Jatola	
10.	Dr. B. R. Rawal		20	Shri. Gangaram Mourya	

Enclosures: Proposed Scheme and Syllabi

II B.TECH.(4YDC) MECHANICAL ENGINEERING

Semester: III

S.No.	Subject Category	Subject Code	Subject	Hours per Week			Th. Credit	Pr. Credit	Maximum Marks				Total
				L	T	P			Th.	CW	SW	Pr.	
1	PCC	ME26011	Fluid Mechanics	3	-	-	3	-	70	30	-	-	100
2	PCC	ME26002	Strength of Materials	3	-	-	3	-	70	30	-	-	100
3	BSC	MA26004	Mathematics -III	3	1	-	4	-	70	30	-	-	100
4	PCC	ME26008	Material Science	3	-	-	3	-	70	30	-	-	100
5	PCC	ME26005	Engineering Thermodynamics	3	-	-	3	-	70	30	-	-	100
6	HSMC	HU26481	Values, Humanity and Professional Ethics	-	2	-	2	-	-	100	-	-	100
7	MC	HUM2001	Constitution of India*	2	-	-	-	-	-	50	-	-	50
8	LC		**Fluid Mechanics Lab**	-	-	2	-	1			40	60	100
9	LC		**Strength of Materials Lab**	-	-	2	-	1			40	60	100
10	LC		**Thermodynamics Lab**	-	-	2	-	1			40	60	100
11	LC		**Material Science Lab**	-	-	2	-	1			40	60	100
			Total	17	3	8	18	4	350	300	160	240	1050

* Non Credit Mandatory Subject.

Semester: IV

S.No.	Subject Category	Subject Code	Subject	Hours per Week			Th. Credit	Pr. Credit	Maximum Marks				Total
				L	T	P			Th.	CW	SW	Pr.	
1	BSC	MA26556	Mathematics-IV	3	1	-	4	-	70	30	-	-	100
2	PCC	ME26551	Machine Design - I	3	-	-	3	-	70	30	-	-	100
3	PCC	ME xxxx	**Kinematics & Dynamics of Machines**	3	-	-	3	-	70	30	-	-	100
4	ESC	ME xxxx	Measurement & Control Systems	3	-	-	3	-	70	30	-	-	100
5	PCC	IP26553	Manufacturing Processes - I	3	-	-	3	-	70	30	-	-	100
6	HSMC	HU26507	Economics for Engineers	3	-	-	3	-	70	30	-	-	100
7	PCC	ME26xxx	**Machine Drawing**	-	-	2	-	1	-	-	40	60	100
8	MC	HUM	Essence of Indian Knowledge Tradition*	2	-	-	-	-	-	50	-	-	50
9	LC	ME xxxx	**Machine Design-I Lab**	-	-	2	-	1		-	40	60	100
10	LC	ME xxxx	**Kinematics & Dynamics of Machines Lab**	-	-	2	-	1		-	40	60	100
11	LC	ME xxxx	**Measurement & Control Systems Lab**	-	-	2	-	1		-	40	60	100
12	LC	ME xxxx	**Manufacturing Processes -I Lab**	-	-	2	-	1		-	40	60	100
			Total	20	1	10	19	5	420	180	200	300	1150

Internship of minimum 02 weeks between semester IV & semester V. To be evaluated in Semester V.
* Non Credit Mandatory Subject.

Highlighted text are Proposed Changes

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III B.E.(4YDC) MECHANICAL ENGINEERING

SEMESTER - V

S. No.	Subject Category	Subject Code	Subject	Hours per Week			Th. Credit	Pr. Credit	Maximum Marks				
				L	T	P			Th.	CW	SW	Pr.	Total
1	PCC	ME xxxx	**Computer Aided Design**	3	-	-	3	-	70	30	-	-	100
2	PCC	ME xxxx	Mechatronics and Automation	3	-	-	3	-	70	30	-	-	100
3	PCC	ME xxxx	**Heat Transfer**	3	-	-	3	-	70	30	-	-	100
4	PCC	ME36007	Steam and Gas Power Systems	3	-	-	3	-	70	30	-	-	100
5	PCC	IP36062	Manufacturing Processes-II	3	-	-	3	-	70	30	-	-	100
6	PROJ	ME xxxx	Evaluation of Industrial Training/ Internship	-	-	4	-	2	-	-	100	-	100
7	MC	ME	Environmental Sciences	2	-	-	-	-		50			50
8	LC	ME xxxx	**CAD Lab**			2	-	1			40	60	100
9	LC	ME xxxx	**Mechatronics and Automation Lab**			2	-	1			40	60	100
10	LC	ME xxxx	**Heat Transfer Lab**			2	-	1			40	60	100
11	LC	ME xxxx	**Manufacturing Processes-II Lab**			2	-	1			40	60	100
			TOTAL	17	-	12	15	6	350	200	260	240	1050

Highlighted text are Proposed Changes

SEMESTER - VI

S. No.	Subject Category	Subject Code	Subject	Hours per Week			Th. Credit	Pr. Credit	Maximum Marks				
				L	T	P			Th.	CW	SW	Pr.	Total
1	PCC	ME36501	Refrigeration and Air conditioning	3	-	-	3	-	70	30	-	-	100
2	PCC	ME36503	Machine Design – II	3	-	-	3	-	70	30	-	-	100
3	PCC	ME36506	Fluid Machinery	3	-	-	3	-	70	30	-	-	100
4	PEC	ME36509	Internal Combustion Engines	3	-	-	3	-	70	30	-	-	100
5	HSMC	IP36504	Industrial Engineering and Production Management	3	-	-	3	-	70	30	-	-	100
6	PROJ	ME xxxx	Minor Project	-	-	4	-	2	-	-	100	-	100
7	LC	ME xxxx	Refrigeration and Air-conditioning Lab	-	-	2	-	1			40	60	100
8	LC	ME xxxx	Machine Design II Lab	-	-	4	-	2			40	60	100
9	LC	ME xxxx	Fluid Machinery Lab	-	-	2	-	1			40	60	100
10	LC	ME xxxx	IC Engine Lab	-	-	2	-	1			40	60	100
			Total	15	0	14	15	7	350	150	260	240	1000

Internship of minimum 02 weeks between semester VI & semester VII. To be evaluated in Sem VII.

Highlighted text are Proposed Changes

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IV B.Tech.(4YDC) MECHANICAL ENGINEERING

SEMESTER - VII

S.No.	Subject Category	Subject Code	Subject	Hours per Week			Th. Credit	Pr. Credit	Maximum Marks				
				L	T	P			Th.	CW	SW	Pr.	Total
1	PEC	ME46018	Automobile Engineering	3	-	-	3	-	70	30	-	-	100
2	PEC	ME46051	Vibration and Noise Control	3	-	-	3	-	70	30	-	-	100
3	PEC	ME46020	Finite Element Analysis	3	-	-	3	-	70	30	-	-	100
4	PEC		Elective-I	3	-	-	3	-	70	30	-	-	100
5	PEC		Elective-II	3	-	-	3	-	70	30	-	-	100
6	PROJ	ME46481	Evaluation of Industrial Training/ Internship	-	-	-	-	2	-	-	100	-	100
7	PROJ	ME46498	Major Project Phase-I (AB group)	-	-	6	-	3	-	-	40	60	100
8	PROJ	ME46998	Major Project Phase-II (BA Group)	-	-	8	-	4	-	-	60	90	150
9	LC	ME xxxx	Automobile Engineering Lab	-	-	2	-	1	-	-	40	60	100
10	LC	ME xxxx	Vibration and Noise Control Lab	-	-	2	-	1	-	-	40	60	100
11	LC	ME xxxx	Simulation Lab	-	-	2	-	1	-	-	40	60	100
Total			For AB Group	15	0	12	15	8	350	150	260	240	1000
			For BA Group	15	0	14	15	9	350	150	280	270	1050

	Elective I		Elective II
ME46219	Advanced Machine Design	IP46316	Operational Research
	Advanced Materials	ME46315	Hydraulic, Pneumatic & Fluidic Control
	Design of Air Conditioning Equipment		Bio - Mechanics
	Computer Aided Manufacturing		Industrial Tribology and Maintenance Engg
	Robotics	ME46327	Data Science and Machine Learning
	Computational Fluid Dynamics		Power Plant and Energy Management

SEMESTER - VIII

S. No.	Subject Category	Subject Code	Subject	Hours per Week			Th. Credit	Pr. Credit	Maximum Marks				
				L	T	P			Th.	CW	SW	Pr.	Total
1	PEC		Elective III	3	-	-	3	-	70	30	-	-	100
2	PEC		Elective IV	3	-	-	3	-	70	30	-	-	100
3	PROJ	ME46882	Industrial Training/Internship	-	-	-	-	4	-	-	100	-	100
4	PROJ	ME46998	Major Project Phase- II (AB Group)	-	-	8	-	4	-	-	60	90	150
5	PROJ	ME46498	Major Project Phase-I (BA group)	-	-	6	-	3	-	-	40	60	100
Total			For AB Group	6	0	8	6	8	140	60	160	90	450
			For BA Group	6	0	6	6	7	140	60	140	60	400

Internship of minimum 08 weeks in semester VIII

	Elective III		**Elective IV**
ME46667	Composite Materials		Gas Dynamics & Fluid Flow
ME46668	Renewable Energy Sources	ME46705	Engineering Optimization
	Fault Diagnosis and Condition Monitoring	ME46704	Design of Thermal Systems
IP46669	Industrial Inspection & Quality Control	ME46706	3D Printing and Design
	Rotor Dynamics		**Product Design And Development**
	Artificial Intelligence		Viscous Fluid Flow

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FAULT DAIGNOSIS AND CONDITION MONITORING

COURSE OUTCOMES

On successful completion of this course, the students will be able to:

CO1: Understand the condition-based monitoring used in industries.
CO2: Apply condition monitoring techniques.
CO3: Analyze the signals in time and frequency domains.
CO4: Identify suitable methods for machine diagnoses.
CO5: Diagnose the faults in machines.

COURSE CONTENT

Unit I: Introduction to condition-based monitoring, fault diagnosis and prognosis, Condition monitoring techniques: vibration and noise monitoring, wear debris and oil analysis, thermography, acoustic emission, ultrasonics, Eddy current. Lubrication monitoring, SOAP, wear particles analysis, ferrography, ferrographical analyzer.

Unit II:
Various vibration parameters, statistical parameters i.e. RMS value, peak value, crest factor, kurtosis, standard deviation of vibration signals. vibration parameters, time and frequency domain signals, Random vibration, Auto/Cross Co-relation functions, Power Spectral Density (PSD), Vibration identification and diagnostic tables, vibration standards

Unit III: Instrumentation: vibration monitoring instruments, data recording, data acquisition, errors in measurements, transducers, accelerometer, sound level meter. sound level data processing.

Unit IV: Signal processing: sample rate and aliasing, filtering, time domain signal analysis, frequency domain signal analysis, non-stationery signal analysis, Fourier series, Fast Fourier Transform and its applications, wavelet transform, Hilbert transform, modulation and sidebands, orbit and order analysis, cepstrum analysis.

Unit V: Faults in rotating machines: unbalance, misalignment, rotor bow, crack, spalling, loosening, fault in electrical machines. Failure analysis of rotating machines, bearings and gears, fans, blowers, pumps, IC Engines. Applications of Machine learning in fault diagnosis.

Reference books:

1. Machinery Condition Monitoring: Principles and Practices, Mohanty A.R., CRC Press, 2014.
2. Rotor Systems: Analysis and Identification, Tiwari, R., CRD Press, 2017
3. Vibration Condition Mon itoring, Rao J. S., Narosa Publishing House, 2000.
4. . Instrumentation, Measurement and Analysis, Choudary K K., Tata McGraw Hill, 2012
5. Vibration Based Condition Monitoring, Randall R. B., Wiley
6. Fault Diagnosis Application, Isermann R., Springer-Verlag Berlin, 2011.

Advanced Materials

Course Outcomes:

At the end of the course, the student will be able to:
CO1: Explain the concepts and principles of advanced materials and manufacturing processes.
CO2: Describe the applications of all kinds of Industrial materials.
CO3: Apply the material selection concepts to select a material for a given application.
CO4: Define Nanotechnology, Describe nano material characterization.
CO5: Explain the behaviour and applications of smart materials, ceramics, glasses and non-metallic materials.

Unit-1
Classification and Selection of Materials:
Classification of materials, properties required in Engineering materials, Selection of Materials: Motivation for selection, cost basis and service requirements - Selection for mechanical properties, strength, toughness, fatigue and creep - Selection for surface durability corrosion and wear resistance – Relationship between materials selection and processing - Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications.

Unit-2
Composite Materials:
Fiber reinforced, laminated and dispersed materials with metallic matrix of aluminium, copper and Titanium alloys and with non-metallic matrix of unsaturated polyesters and epoxy resins. Development, Important properties and applications of these materials.

Unit-3
Ceramics and Glasses -
Bio-ceramics: Nearly inert ceramics, bio-reactive glasses and glass ceramics, porous ceramics: Calcium phosphate ceramics: grafts, coatings Physico-chemical surface modification of materials used in medicine.
Low & High Temperature Materials:
Properties required for low temperature applications, Materials available for low temperature applications, Requirements of materials for high temperature applications, Materials available for high temperature applications, Applications of low and high temperature materials.

Unit-4
Modern Metallic Materials:
Dual Steels, Micro alloyed, High Strength Low alloy (HSLA) Steel, Transformation induced plasticity (TRIP) Steel, Maraging Steel, Inter metallics, Ni and Ti Aluminides. Non-metallic Materials: Polymeric materials and their molecular structures, Production Techniques for Fibers, Foams, Adhesives and Coatings, structure, Properties and Applications of Engineering Polymers.

Unit-5
Smart Materials:
Shape Memory Alloys, Varistors and Intelligent materials for bio-medical applications. Nanomaterials: Definition, Types of nanomaterials including carbon nanotubes and nanocomposites, Physical and mechanical properties, Applications of nanomaterials.

Reference Books
1 Engineering Material Technology James A. Jacobs & Thomas F. Kilduff Prentice Hall
2 Materials Science and Engineering WD. Callister Jr. Wiley India Pvt. Ltd 2010
3 Engineering Design: A Materials and Processing Approach G.E. Dieter McGraw Hill 1991
4 Materials Selection in Mechanical Design M.F. Ashby Pergamon Press 1992
5 Introduction to Engineering Materials & Manufacturing Processes NIIT Prentice Hall of India
6 Engineering Materials Properties and Selection Kenneth G. Budinski Prentice Hall of India
7 Selection of Engineering Materials Gladius Lewis Prentice-Hall, New Jersey

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CODE	SUBJECT NAME	L	T	P	Credits			Maximum Marks				
					T	P	Total	Th.	CW	SW	Pr.	Total
ME 26xxx	Machine Drawing	-	-	2	-	1	1	-	-	40	60	100

Pre-requisites: ME 10149

Course Assessment:

The following methods are adopted for the assessment of this course;

1. **Sessional Work** (40 marks) on the basis of internal viva and continuous laboratory journal assessment and laboratory attendance.
2. **Practical Examination** (60 Marks) on the basis of evaluating practical knowledge, quiz and viva-voce.

Course Outcomes:

CO1	Understand standard drawing conventions and practices
CO2	Represent surface finish and tolerances of machine elements in drawing.
CO3	Draw the machine elements like couplings, cotters, riveted, bolted and welded joints.
CO4	Prepare an assembly drawing using part drawings of machine components.

COURSE CONTENTS

Unit 1

Sectioning and drawing conventions for types of threads, welded joints, surface roughness value and grade. Fits and tolerances- symbols and applications, Dimensioning, Use of standards and codes (BIS, ISO etc.)

Orthographic projections of simple machine parts such as threaded fasteners, pulleys, keys, cotters, pins etc.

Unit 2

Types of assembly drawings, norms and sequences of preparing assembly drawings

Orthographic projections of Nut-Bolt-Washer assembly, Riveted joints,

Unit 3

Orthographic projections of cotter joint, knuckle joint, flanged coupling, universal coupling, Oldham's coupling. Pipe joints.

Unit 4

Bearings: Bushed bearing, Plummer block, foot step bearing.

Engine parts like piston, connecting rod, eccentric, and crankshaft.

Unit 5

Types of valves like ball valve, flap valve, stop valve, feed check valve, safety valves, blow off cock, tool post.

NOTE: Each candidate should complete himself at least 4-5 full imperial/A3 size sheets during the semester

Text Books:

1 Bhatt N.D. and Panchal V.M., Machine Drawing, Charotar Publishing House, 2000
2 K L Narayana, P Kannaiah, K Venkata Reddy, Machine Drawing, New Age International Publication, 2014

References Books:

1 IS Code: SP 46 – 2003, Engineering Drawing Practice
2 Laxminarayan and Mathur, Machine Drawing, Jain Bros, New Delhi, 1983

ME xxxx : Kinematics and Dynamics of Machines

At the end of the course students will be able to

CO1 Construct the motion of planar four-link mechanisms and draw their velocity and acceleration diagrams.

CO2: Determine the parameters of gears and the velocity ratio of gear trains.

CO3: Construct different types of cam profiles, and determine gyroscopic couple and its effects

CO4: Determine power transmitted/lost/absorbed in different friction devices like thrust bearings, clutches, belt drives and dynamometers.

CO5: Analyze dynamics of simple mechanisms, flywheel, and balance rotating and reciprocating masses

Unit 1: Basic Mechanisms and their Motion Analysis

Kinematic link, Kinematic pairs, Kinematic chain, classification, Degree of freedom of chain and mechanism, Grubler's and Kutchbach Criterion. Inversions of four bar chain, single slider crank chain, and double slider crank chain. Number synthesis with number of links less than or equal to eight. Various Mechanisms with lower pairs.

Velocity and acceleration analysis, Relative velocity and relative acceleration approach, Problems with Coriolis component of acceleration. Instantaneous centre method, Keneddy's theorem and its applications.

Unit II: Gears, Gear Trains, Cam-followers

Toothed Gearing: Types of gears, Terminology, Condition for correct gearing. Tooth profiles- cycloidal and involute gears, Tooth proportions, Interference and its prevention.

Gear trains, Tabular and algebraic approach of solution. Differential gear box.

Unit III: CAMs-followers and Gyroscope

Types of CAMS, Terminology, Generation of CAM profile for specified follower motions.

Gyroscopic couple and its effects.

Unit IV: Friction devices:

Pivot and Collar Bearing, Belt, Rope and Chain Drives.

Clutches, Brakes and Dynamometer: Plate Clutch, Cone Clutch, block brake, band brake, the band and block brake, Types of dynamometers, Prony brake dynamometer, Rope brake dynamometer, hydraulic absorption dynamometer.

Unit V: Dynamic force analysis and balancing

Dynamic Force analysis of Simple Mechanisms, Equations of motion for four-bar and slider-crank mechanisms. Piston Efforts and Crank Effort Diagrams, Fluctuation of energy and speed, The Flywheel.

Balancing of rotating masses, Primary balancing of reciprocating masses, secondary balancing of reciprocating masses. Condition of balance in V-Engine, radial engine and multi cylinder inline engine.

Text Books

1. Bevan T., Theory of Machines, C B S Publishers, 1993
2. Ambekar A. G., Mechanism & Machine Theory, Prentice-hall of India, 2007
3. Ratan S.S., Theory of Machines, Tata Mcgraw Hill, 2009

References Books:

1. Shigley J. E., Theory of Machines (Kinematics), Tata Mcgraw Hill, 1981